VOLUME 4 1928 NUMBER 1

ECONOMIC GEOGRAPHY

JANUARY

LARK UNIVERSITY, WORCESTER, MASSACHUSETTS, U.S.A.

OUR CONTRIBUTORS

Dr. Jones, associate professor of economic geography at Clark University, contributes the first instalment of the "Agricultural Regions of South America," a study based on field work in western and southern South America, with original statistical materials used in all the crop and animal maps, and on the published materials of each region.

Miss Poggi is assistant in geography at the State University of Illinois, Urbana, where she is also doing graduate work. This paper grew out of part of her thesis which she presented for the Geography diploma of the London University at the London School of Economics. Until 1924, Miss Poggi was in charge of the geography department of the Camden School for Girls, one of London's largest endowed secondary schools.

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ECONOMIC GEOGRAPHY

VOLUME IV, 1928

Published by
CLARK UNIVERSITY
Publication Office, 10 Ferry Street, Concord, N. H.
Editorial Office, Worcester, Mass.

ECONOMIC GEOGRAPHY

CONTENTS FOR JANUARY, 1928

ECONOMIC GEOGRAPHY

Published Quarterly by

CLARK UNIVERSITY, at 10 Ferry Street, Concord, N. H.

Editorial Office: Clark University, Worcester, Massachusetts

PRICE $1.50 THE CURRENT NUMBER FIVE DOLLARS A YEAR

(except to charter subscribers)

Entered as second class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.

THE NEW SOIL SCIENCE

WITH an evergrowing interest in the wise utilization and reasonable conservation of all resources, the American people are turning slowly but surely to sound scientific method, away from the haphazard misnamed "practical" policy of the past. In agriculture, trade, manufacturing, medicine and health, education, in fact in every phase of human activity, the "scientific method" is being adopted, not always discreetly, not always with intelligent direction, but generally, with success.

In no field of research has greater progress been made than in the study of soils. The Bureau of Soils in the United States Department of Agriculture has led the way in America, and is now forging to the very forefront in the research carried on in all parts of the world; but for many years the Europeans, led by such men as Ramann, Glinka, Frosterus, and Murgoci have been the pioneers. Perhaps in no country has such an extensive program of soil study been carried out as in Russia, while the United States has mapped intensively probably the largest area.

The development of soil science in America has been dominated until in recent years by the controversy between the school of which Cyril G. Hopkins of the University of Illinois was the chief protagonist and to which the chemical composition of the soil was significant, and the school led by Milton Whitney of the United States Bureau of Soils to which the physical and textual characteristics of the soils were most important. Happily their opposing views have been reconciled in the recent developments of the science, so that progress goes on apace.

Every student of agricultural geography particularly, and every student of economic geography and agriculture as well, owes it to himself to become familiar with the results of the latest researches into soils as distinct phenomena, with their own characteristics of development through an orderly cycle or succession of forms as distinctive and definite as that of vegetation or land form, and the effect of these successional stages upon the utilization of the soil.

ECONOMIC GEOGRAPHY

VOL. 4 JANUARY, 1928 No. 1

AGRICULTURAL REGIONS OF SOUTH AMERICA

Clarence F. Jones

Economic Geographer, Clark University

SOUTH AMERICAN agriculture exhibits the complete list of farm, range, and forest products, from the cacao of the calm, hot, rainy slopes and valleys of Ecuador and Bahía, and the rice of the low, hot, humid diked lands of British Guiana, through the extensive coffee plantations on the São Paulo and Medellín plateaus, the cotton estates of the Chaco and the irrigated valleys of Peru, the wheat, corn, beef cattle, and swine of the Pampa and the Central Valley of Chile, to the mutton and wool of the bleak moorland of southern Patagonia and Tierra del Fuego. It furnishes or can furnish most of the crops and animal products required to satisfy the manifold needs and desires of man in various stages of civilization from that of the head hunting tribes of upper Amazonia to the landed aristocracy of the small but wealthy republic of Uruguay. Yet, South America has a smaller population than any of the other continents (except Australia) both in numbers (65,775,000), and in density (about eight per square mile). With about 8½ per cent of the land area of the world, it holds only 3½ per cent of the world's population, thus, on the whole, being sparsely populated in the face of an abundance of tropical foodstuffs. Most of the people dwell near its borders and in the tropical highlands. Deep, tranquil tropical forests, barren, parched deserts, and rugged, cold mountain areas—nearly one-half of the continent—have a population density of much less than one person per square mile.

Consequently, South America, in contrast to North America and especially to Europe, represents in its entirety an area in which agriculture is in a distinctly transitional stage. In only a few areas has the agriculture attained the permanency of that in the more densely settled areas of Europe and North America, where increasing population, concentration, rising standard of living, the use of agricultural machinery, the advance in knowledge and practice of agriculture, improved transportation facilities, and a mobile supply of capital and labor have brought about a progressively stronger influence of the physical factors—moisture, temperature, relief, and soil—in the establishment of crops, livestock, systems of land tenure, and methods of farming. In a more complete adjustment of agriculture to both physical factors and economic conditions, the regions of Europe and North America have reached a stability not characteristic of most sections of South America.

FIGURE 1.—From the standpoint of relief, South America falls naturally into three major divisions: the old Guianan and Brazilian highlands, the central lowlands and coastal plains, and the massive continuous Cordillera. Sixty-five per cent of the continent lies below one thousand feet elevation.

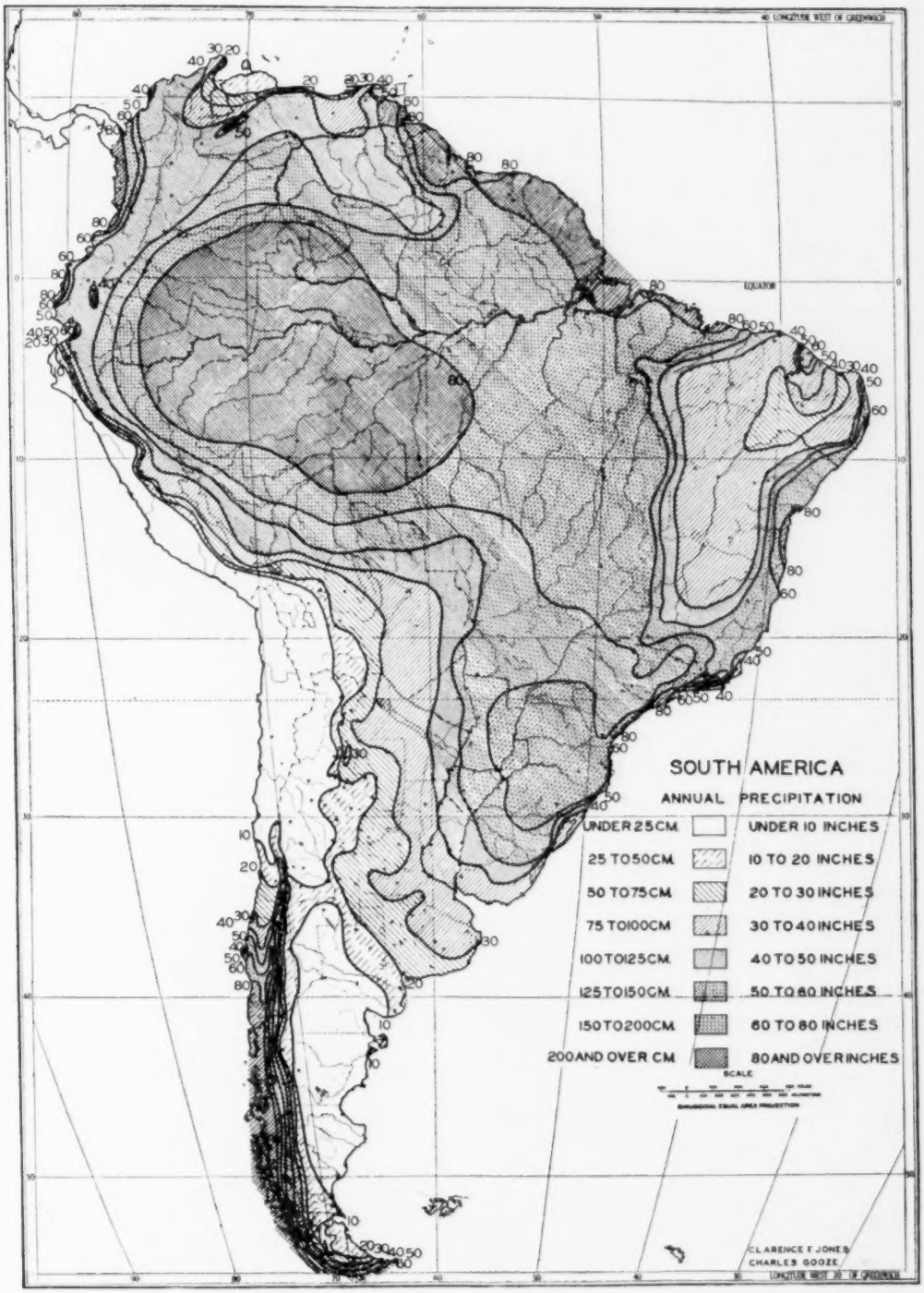
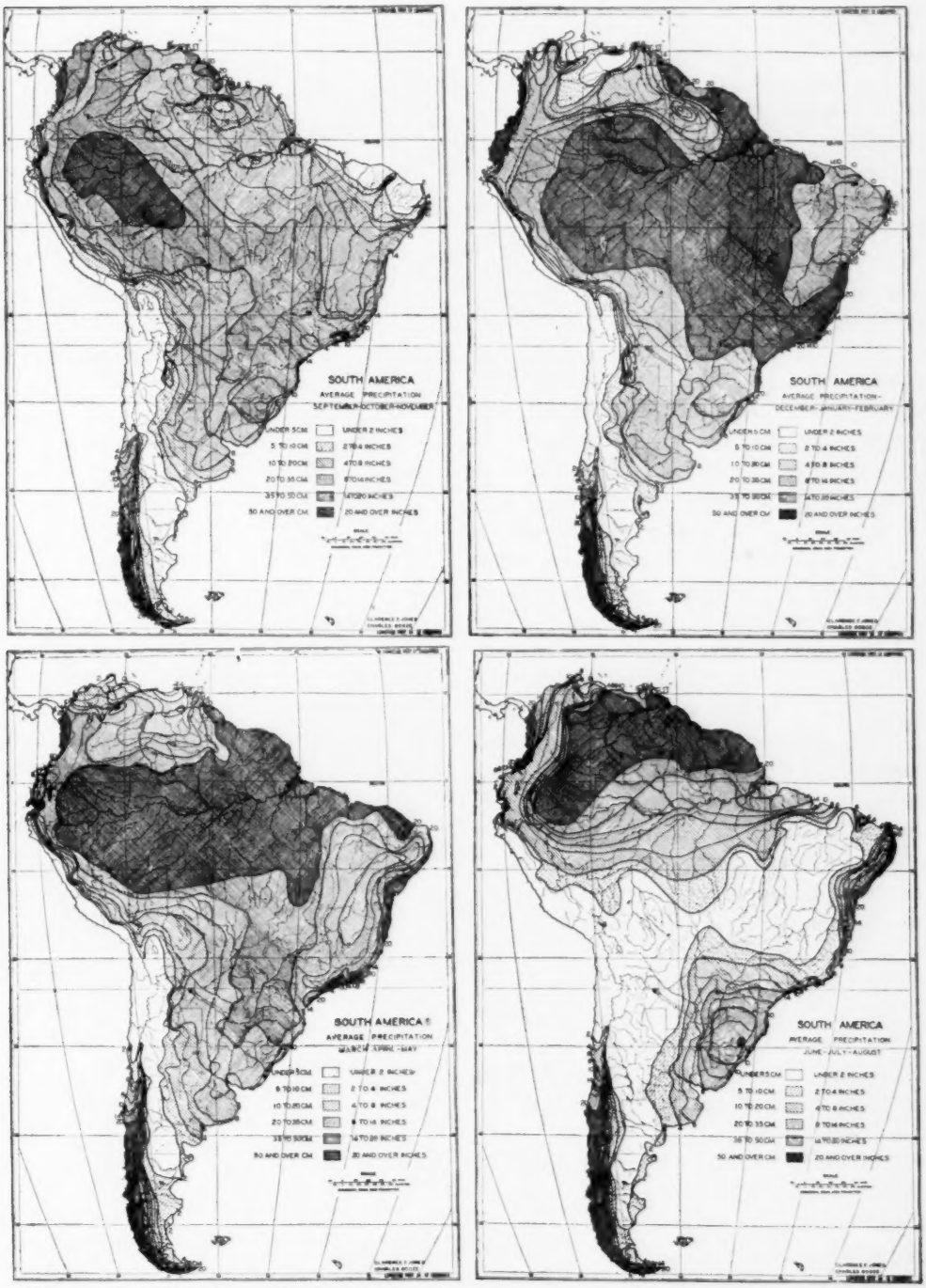


FIGURE 2.—The annual rainfall of South America shows all gradations from the almost rainless desert of the west coast to the drenched region of the Upper Amazon. The amount of rainfall, the vegetation, relief, and soils have been significant in the delineation of agricultural regions.

Furthermore, in these old areas of dense population pressing upon the land for a food supply, a wealth of historical and statistical information makes possible a more definite delineation of the border zones of agricultural regions than in a relatively new land of sparse population, less close adjustment, and of meagre information. Yet these conditions do not render undesirable a study of the agricultural regions of South America. In fact the rise of the banana industry of Santa Marta, the growth of the coffee industry of São Paulo, the expansion of cereal culture in the Pampa, the evolution of the meat trade of Argentina, the decline of the cacao trade of Ecuador, the possibilities of the moist lowlands of the tropics, and the future of the vast *campos* and *llanos* challenge the careful attention of agricultural and commercial men the world over.

While the development of the hot, moist tropics throughout their extent as a great producing area of foodstuffs and raw materials for temperate lands has excited the imagination of the temperate peoples who have already begun to feel the need for additional sources of food, the hope of a great tropical granary and storehouse, so far as South America is concerned, seems little more than fancy. It is true that man, with the aid of medicine, sanitation, engineering, and native labor has penetrated the heart of the jungle, created of veritable pest holes beautiful and healthful places in which to live, and tasted of the fruits of tropical abundance. Yet as he penetrates the tropics, the native races increase at an amazing rate to consume the surplus output. In South America the tropical portion, which includes nearly three-fourths of the continent, supplies only a fraction of the total agricultural products; it is inhabited mainly by Indians, negroes, and mestizos who produce little more than they consume. And why should they? They need little or no clothing; a crude, easily constructed pole-grass-thatched hut furnishes shelter from the sun and the rain; a few banana trees and a patch of corn, beans, or manioc supply food. Immigrants avoid these lands owing to the social life established by the native and to the prevalence of diseases and insects—malaria, tropical dysentery, and hook-worm, which sap the vitality and even the lives of the natives dwelling there.

Although nearly three-fourths of the continent lies within the tropics, it presents a striking diversity of temperatures, precipitation, relief, soil, and vegetation, but it lacks in general, the "extraordinary uniformity of economic opportunity and of social conditions," characteristic of the major part of North America. Temperatures range from the tropical in much of the northern portion to temperate in the high plateau of Bolivia or the Pampa, and to frigid in Tierra del Fuego. Precipitation shows all gradations in amount and distribution from Atacama, considered the driest desert in the world, to western Colombia with more than 200 inches of rain per year (Fig. 1, 3–6). The Cordillera system, the longest and most continuously high mountain system on earth, lies near the Pacific and stretches from Caribbean headlands to the Horn; in its northern reaches it consists of three ranges separated by deep valleys; in the center its two towering ranges enclose the great Bolivian plateau; in the south, a single main axis decreases in elevation towards the Strait of Magel-



FIGURES 3, 4, 5, and 6.—The distribution of precipitation through the year determines, in many areas, the crops that can be grown, the vegetation that flourishes or withers, and the animals that graze. The vast Amazonian forest results from rain all the year and high temperatures; likewise, the extensive grasslands of Matto Grosso and the Llanos result from a marked rainy season, when all vegetation springs into life, and a desiccating rainless season, when grasses die down to the ground and trees and shrubs become dormant. In many areas of considerable annual rainfall, marked maxima and minima afford the essential moisture for the rapidly growing plants and also the dry harvest season so necessary in the ripening process and in the gathering of the harvest.

lan (Fig. 1). To the east the vast central lowland stretches from the Llanos in the north to the Pampa in the south. Beyond, the Guiana and Brazilian highlands and the adjacent narrow coastal plains complete the major features of the continent. Sixty-five per cent of the continent lies below an altitude of one thousand feet, while 7 per cent rises to more than ten thousand feet.

Outside of small patches in the moist tropical lowlands, most of the agricultural development has taken place on the temperate plains and subtropical plateaus. This is especially true of commercial products, which assume special significance because of the small population of the continent. Two-thirds of the exports of South America consist of products of the farms and ranges from the southeastern part of the continent between 20 and 54 degrees south latitude. The area holds 70 per cent of the total population and about 90 per cent of the people in which the European element predominates; it has 78 per cent of the railway mileage; no part of it lies more than 400 miles from cheap water transportation. Consequently it has become the largest single farm and range surplus foodstuff and raw materials region in the world; it holds an enviable position in coffee, wool, hides, beef, mutton, corn, linseed, and wheat.

THE WHEAT CRESCENT

The Wheat Crescent stretches for 600 miles from the southern part of the Province of Buenos Aires, near Bahía Blanca, to northern Córdoba and central Santa Fé. It embraces the north-south extent of the Pampa, between Río Colorado at the south and *Mar Chiquita* at the north. On the west and north it grades off gradually into the extensive grazing region of western Argentina. On the east it borders the Corn-Flax region and the Eastern Pampas Grazing region. It produces nearly all of the Argentine wheat crop of more than 200 million bushels, in value the leading crop of the republic, and furnishes about one-fifth of the world's exports of wheat and flour. Although predominantly a land of the wheat sower and harvester, it is also characterized by cattle and alfalfa throughout most of its extent, oats and barley in the south, and corn and flax in the north.

THE PHYSICAL CONDITIONS

The physical features of the western Pampa largely determine the Wheat Crescent. The possession of many of the conditions favoring the cultivation of wheat accounts for the importance of this region, and at the same time a divergence from the ideal wheat climate results in the great variations of annual output.

CLIMATE

The growing season ranges from about 300 days in the north to 140 days in the south. Zero weather is practically unknown in the Pampa. Mean winter temperatures of 55° in the north and 46° in the south indicate the character of that season. On the other hand, normal warm season temperatures are not excessive; the mean summer isotherm of 77° includes the northern sections, that of 71° the southern.

On the west, the mean annual isohyet of 20 inches clearly marks the limits of intensive wheat production, and that of 15.7 the western extent of cultivation (Fig. 7).[1] The

[1] Mr. Charles Gooze, candidate for the Doctor of Philosophy in Geography, Clark University, has given valuable assistance in the preparation

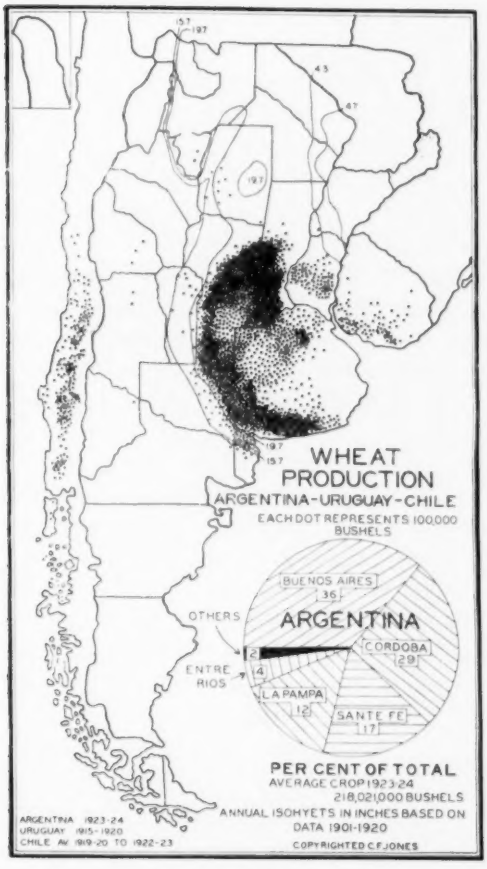


FIGURE 7.—The Wheat Crescent is limited on the west by aridity,—the intensive area of production stops abruptly at the 19.7-inch rainfall line,—on the north by increasing temperatures and humidity, the persistence of the *estancia*, and inadequate transportation facilities, and on the east by corn, cattle, increasing humidity, and areas of hilly land and sandy soils. (Statistics of wheat production from *Estadistica Agro-Pecuaria*, May 1923, and June 1924. Ministerio de Agricultura de la Nacion, Buenos Aires; Hoxmark, Guillermo, "Las Condiciones Climotologicas y el Rendimiento del Trigo," Cir. No. 501, 1925, *De La Oficina Meteorologicia del Ministerio de Agricultura de la Nacion*, Buenos Aires; Chile, *Anuario Estadistico de la Republica de Chile*, Año 1919–20 to 1924–25, Santiago; Uruguay, *Anuario* Estadistico, Director General de Estadistica, Montevideo, Annual.)

rainfall increases, towards the eastern margin to about 34 inches in the north and 27 inches in the south. A summer maximum is characteristic except in the far south; the minimum rainfall corresponds to minimum temperatures, usually the least in the month of July. While temperatures and length of growing season are sufficient, in most of the Wheat Crescent, for the production of a variety of crops, low rainfall and hot and cold winds retard greatly the growth of those crops that must survive the summer. Consequently wheat becomes the dominant crop throughout the area; it also spreads over into all the bordering regions.

Frequency of drought is of great importance to the Argentine wheat grower. In the north droughts accompanied by the locust pest account for practically every large fluctuation in annual production. The region also suffers from (1) wet summers and autumns followed by warm open winters, which encourage the growth of weeds; (2) cold fogs and late frosts in November and December, followed by hot sun and wind; (3) warm winds, accompanied by clear skies and a burning sun, sweep across the plain from the north in the same months and cause thousands of acres of wheat to shrivel; (4) cold, dry *pamperos* from the south, and wet violent winds from the north; and (5) hail-stones, a serious menace in restricted areas.

The yields of wheat are closely related to the distribution of precipitation. The correlation of precipitation and yields of wheat shows that yields have been high in all cases in which precipitation has been above normal during autumn and early winter. Of six years of excellent yields per acre, five years had rainfall under normal in the period from June to November, or the latter part of winter through spring. Maximum yields come with six to eight inches in these months. During the three

of the dot maps of crops and animals of Argentina-Uruguay-Chile, in gathering materials, and in the delineation of the agricultural regions.

winter months two to four inches give the greatest yields, and during the spring months four to six inches. Less than these amounts seems to be insufficient. In excess of these, diminished yields result. However, as winter rainfall increases, the need for spring rains decreases. The most favorable distribution of rain comprises four inches in June-July and an additional four in September-October. In the provinces of Córdoba, La Pampa, and in west-central Buenos Aires, normal winter rainfall is less than the optimum.

Furthermore, in almost every case of high yield, spring temperatures have been below normal, and in almost every case of low acre yield above normal. They have the greatest effect in September and October and the least in June and July. In the north, as a result of early planting, August is the month of greatest effect; in the Province of Buenos Aires, September; in La Pampa, October. Despite certain disadvantages of rainfall distribution and temperature fluctuations, a dry summer harvest period facilitates the use of the combine,—an important feature in wheat culture in Argentina.

RELIEF AND DRAINAGE

The low relief and gently undulating surface favor the extensive cultivation of wheat. The region traversed by only one major stream—the *Carcarañá* and its tributaries—slopes very slightly from west to east, and from north to south. The very gentle slope gives imperfect drainage. With excessive rainfall the waters spread over the land in vast sheets, slowly seeping into the ground, and thus later being used by alfalfa and wheat.

The lands of Córdoba included within the region are best drained. They form an extensive plain, one of the most thoroughly cultivated parts of the Pampa. Many small streams extending from the Sierra de Córdoba, which lies west of the region, unite to form the main tributaries of the *Carcarañá*, which flows to the Paraná. Definitely limiting the Wheat Crescent on the north stretches a vast depression, the lowest part of which is occupied by an immense salt lake—*Mar Chiquita*.

SOILS

The soils of this region consist mostly of fertile friable types, favoring the extensive cultivation of wheat. Stones and gravel are conspicuously rare. Most of the soils have a large humus content. In the southern third of the Crescent, in east central La Pampa and southern Buenos Aires, the soil consists of dark brown silt loam to heavy clay loam, 12 to 24 inches in depth, overlying cherty limestone, a soil with a high water-holding capacity. In western Córdoba a fine sandy loam, a wind deposit, over heavy clay gives a fine wheat soil; in eastern and northern Córdoba, the northern part of the wheat area, it is a dark brown clay loam underlain by a hardpan from a few inches beneath the surface to 35 inches or more; the hardpan layer does not prove especially harmful to wheat except in dry years. In the central section of the Crescent—in northwestern Buenos Aires and southeastern Córdoba—sandy swells, excellent for alfalfa, rise a few feet above the general level of the land, a condition expressed in the wheat and animal maps. So fertile and workable are the soils of the Wheat Crescent that only the Corn-Flax region surpasses it in land suitable for crops.

NATURAL VEGETATION

The natural vegetation of the Wheat Crescent consists largely of the grasses of the Pampa, although the northwestern part includes portions of the *Monte*, a plant association of broad-leaved sclerophyllous scrub and trees, the arid winter and the intensity of precipitation having imposed a strikingly xerophytic character. To the east and south of this area the *Monte* gives way to what were the native grasslands of Argentina before overgrazing and cultivation destroyed the earlier vegetation. The remaining wild range lands support special types of Pampa grasses: *pasto duro*, in which the genus *Stipa* predominates; *pasto blando*, soft grasses and herbs; and *pasto agrio*, sour reed-grass on swampy soils combined with the high pampa grass (*Cortaderia Argentea*).[2]

PRODUCTS OF THE WHEAT CRESCENT

Although a number of crops grow in various parts of the region, wheat dominates. In southern Santa Fé, near Rafaela, it occupies 40 to 50 per cent of the total land area; in eastern and southern Córdoba 20 to 40 per cent; in northern La Pampa, 20 to 40 per cent; and north and west of Bahía Blanca, 20 to 40 per cent. Cattle and alfalfa are found over the whole area; corn and flax grow on the north; oats, barley, and rye are produced in the south.

WHEAT

From the standpoint of varieties of wheat, four districts stand out: the northwest in *Barletta* wheat, the central and southern sections for frost resistant wheat, and the southwest, the coolest and driest portion, for the Russian and Kanred wheats.

Barletta, brought from Italy, resembles the Turkey Red of Kansas, although the grains are softer and the quality not quite so good. It will remain in mature condition on the stalks for a long period without being shelled out by high winds. It best combines the qualities resistant to severe droughts and rust, extreme heat and cold, damp, and fogs.

The Russian, well adapted to the climate of the southern part of the region, matures early and gives a high gluten content, but when ripe it shells out easily. Therefore it does not lend itself to a long harvest period by the combine.

The Hungarian wheat, cultivated in the western Province of Buenos Aires, is a hard variety which does well on sandy soils. It yields better than other varieties of better quality, but which demand more fertile soils and more care in cultivation.

The Lombard, or Italian wheat, is well adapted to the climatic conditions of the central and northern portions of the wheat region, although its cultivation is not extensive.

Candeal, the chief durum wheat of Argentina, does especially well in the central and western portions of the Province of Buenos Aires. Also it is cultivated in Entre Ríos, outside of the region proper. *Tagan*-rock, also a hardy durum wheat resistant to diseases does not shell out easily and is cultivated in the same areas as *Candeal*.

Kanred wheat, recently introduced into Argentina, seems well adaptable to sandy, rather infertile, and droughty soils. In a few years its cultivation has increased greatly.

Extensive wheat culture is well

[2] Whether the Pampa is a natural or culturally induced grass-land is still controversial. Schmeider, Oscar, "The Pampa, a Natural or Culturally Induced Grass-Land," *Univ. of Calif. Pub. Geog.*, Vol. 2, pp. 255–270, 1927.

suited to the physical conditions in the region. The mild winters and the moist springs promote the proper stooling of the wheat, while the dry sunny ripening period favors the early maturity of a hard wheat of high gluten content. Also the dry harvest period and the almost level land permit the use of large harvesting machines during a long harvest season.

FIGURE 8.—An immigrant Adobe Hut without Floor, and covered with Galvanized Iron Sheeting, near Ceres, Province, Santa Fé. The immigrant, usually an Italian, arriving without capital sets up a home of this character on one of the large *estancias*. He secures from the land owner seed, implements and animals for the cultivation of wheat or another crop. In return for the use of the land, animals and the implements he delivers one half or more of the crop to the owner. All members of the family work hard. They have no comforts, only bare necessities. Yet these people living in a modest way have been a prime factor in the expansion of the wheat belt into the domain of the cattle *estancias*.

Methods of Crop Production

Wheat is grown by three types of farmers: the *medianero* or share-worker, the colonist, and the *arrendatario* or tenant.

On the large land holdings of *estancieros*, who are reluctant to divide their immense estates, *medianeros* contract for a piece of land on which to raise wheat. Often the farmer, most frequently an Italian, contracts to farm 400 to 500 acres. The landowner may furnish the horses, the machinery, and the seed; at the end of the season he sells the wheat and the net proceeds are divided, as a rule, evenly between the farmer and the landowner, the former of whom dwells with his large family, most of whom labor on the farm, in a grass-thatched-covered, mud hut (Fig. 8). Usually he remains in one place only a few years. He tills the land in an extensive manner and has no incentive to efficiently care for it. This method gives low yields per acre. Yet a decade ago it was estimated that family labor of this type produced three-fourths of the wheat crop of Argentina.

In the northern part of the Crescent many colonies of Italians, Swiss, and French established by great leaders began the extensive cultivation of wheat. In the departments of *Las Colonias* in southern Santa Fé the colonies were described in 1882 as a vast lake of wheat; of 317,500 acres of cultivated land in Santa Fé in 1882, 280,000 were devoted to wheat. This section today is the area of greatest

production, with 40 to 50 per cent of the total land area in wheat.

Arrendatarios, who possess sufficient funds for equipment rather than to farm on a small scale, prefer to rent land and farm on an extensive scale. They rent from 25 to 750 acres or more, employing machinery they have purchased, and pay rent in the form of part of the crop or in cash. They live in crudely constructed huts, make no improvements, and farm one crop extensively. They do not grow even the fruits and vegetables for home use.

Over most of the region shallow plowing is the rule, although in some sections a deep plowing in February or March may be followed in May or June by a shallow plowing or discing, which increases the yield after a few years of cropping. One or two harrowings across the furrows prepare the land for wheat.

Although large drills are becoming common, much of the grain is sown with broad-cast seeders or by hand. In the region of the colonies in Santa Fé the seed is sown in panels from 200 to 260 feet in width and 2,600 to 3,300 feet in length. A harrow drawn at right angles to the furrows covers the wheat. As the best seed is sold, the percentage of germination reaches only 50. The season of seeding extends from May in the north to August in the south.

From November to January headers, binders, and combine harvester-threshers harvest the grains. Headers are used chiefly in Santa Fé and Córdoba, binders in northwestern Buenos Aires and in Entre Ríos, and combines in southwestern Buenos Aires, where labor is most scarce. The grain cut with binders is threshed from the shock, that with headers is generally stacked with one covering for late threshing, while the combine performs the cutting and threshing in one operation, dropping the grain in bags as it proceeds across the field.

Although the stripper-harvester has many disadvantages the rapidity with which it accomplishes the task and the saving of labor increase its use (Fig. 9).

FIGURE 9.—The Use of the Modern Combine in the Wheat Crescent of Argentina has been a prime factor in the increased crop of Argentina. The rapidity with which it accomplishes the work, the saving of labor, level land, dry harvest period, and non-shattering grains, favor its extensive use. (Courtesy of International Harvester Company.)

It requires certain conditions for successful operation: level land, grain thoroughly ripe and dry, non-shattering grain—*Barletta* is especially suitable—a dry sunny harvest period without winds so that the grain will remain standing, and dry firm fields at the time of harvesting and threshing. Periods of rainy weather at harvest time may cause huge losses, as the wheat may fall or as machines cannot enter the fields. The combine moves from *estancia* to *estancia*, doing the work of harvesting on a percentage basis, usually one sack out of three.

Despite the employment of the best of labor saving machinery, the huge harvest calls for thousands of laborers for whom Argentina can provide no work at other seasons. The migrations of Italians and a few Spaniards, at the close of their harvests at home, to garner the golden grain of Argentina has amounted in recent years to 180,000. These so-called *golondrinas*, or swallows, consist of hard-working men, who live on little, and reap the high wages of the Argentine harvest; they supplement the work of the peon who prefers a life in the saddle to one of manual labor and by their departure for home they relieve the labor market of a burden during the slack season.

CROP COMBINATIONS

A number of crop combinations exist in the Wheat Crescent, a region commonly thought of in terms of wheat only.

Wheat, Alfalfa, and Cattle

Fully one-half of the grain exported from Argentina is incidental to cattle raising. The *creole* cattle were sufficiently well fed on native grasses of the Pampa, but better stock demanded improved pasture. To obtain alfalfa range, contracts were made with the wheat producers, usually the Italian immigrants, to raise four crops of wheat and then seed the land with alfalfa, with seed supplied by the land owner. Work during the five years, carefully superintended on many estates, results in excellent alfalfa range. The immigrant farmers then seek new lands so that fine cattle may thrive on the alfalfa pastures. When pastures become ragged and weedy as a result of age, new contracts bring in wheat farmers for another five-year period. Approximately one-third of the area devoted to alfalfa for fine cattle range in Argentina lies in the Wheat Crescent.

Wheat and Corn

Early colonists in the northern district of the region found that wheat did better on land first planted with corn. Since they desired land for wheat, although well-tended corn yielded profits fully as great, they cared for the crop rather casually. Shallow plowing prevailed; corn was scattered broadcast. As a result weeds so choked the field that harvests became highly unprofitable. Wheat spread westward and to the south, but near Rosario corn soon displaced it. Corn, more limited climatically, gave greater profits per acre. However, in this area corn and wheat are permanently associated; the two are rotated. The wheat crop benefits considerably by the constant weeding and clearing which corn requires.

Wheat and Flax

In central Santa Fé, flax is rotated with wheat, commonly in four fields: flax one year and wheat three. Each year flax shifts to a field that has been three years in wheat. It is found throughout the northern part of the Wheat Crescent.

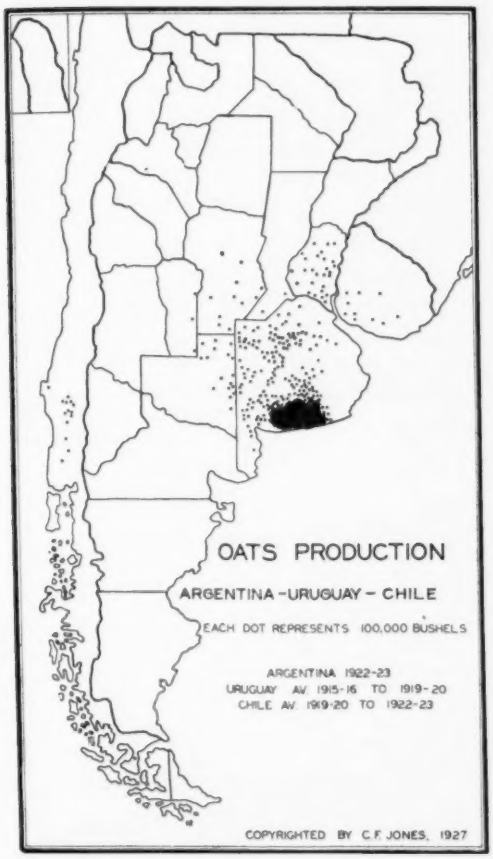


FIGURE 10.—Although oats are produced throughout the Pampa, nearly all of the crop comes from the cooler and moister section of the south-eastern part of the Wheat Crescent in southern Buenos Aires. (Argentina, *Estadistica Agro-Pecuaria*, Mayo, 1923, pp. 201–207; Uruguay, *Anuario Estadistico, Director General de Estadistica*, Montevideo, Annual; Chile, *Anuario Estadistico de la Republica de Chile*, Año 1919–20 to 1924–25, Santiago.)

Wheat, Alfalfa, and Corn

While crop rotation in Argentina is in its infancy, it promises much. In sowing wheat continually, yields per acre diminish annually and fields are overrun by troublesome weeds. A rotation of wheat, alfalfa, and corn provides a large profit from corn, 10 to 20 per cent greater yields of wheat on corn stubble, excellent alfalfa pasture for the animals, and a fertilizer added to the soil.

Wheat, Oats, Barley, and Rye

In the region near Bahía Blanca oats are sown for three purposes: (1) as a crop in rotation with wheat, (2) as a winter forage or as a hay crop, (3) for export. The area is the center of 2½ million acres annually given over to oats (Fig. 10). In an area almost co-extensive with that producing oats, but totalling only one-fifth as much in acreage barley cultivation

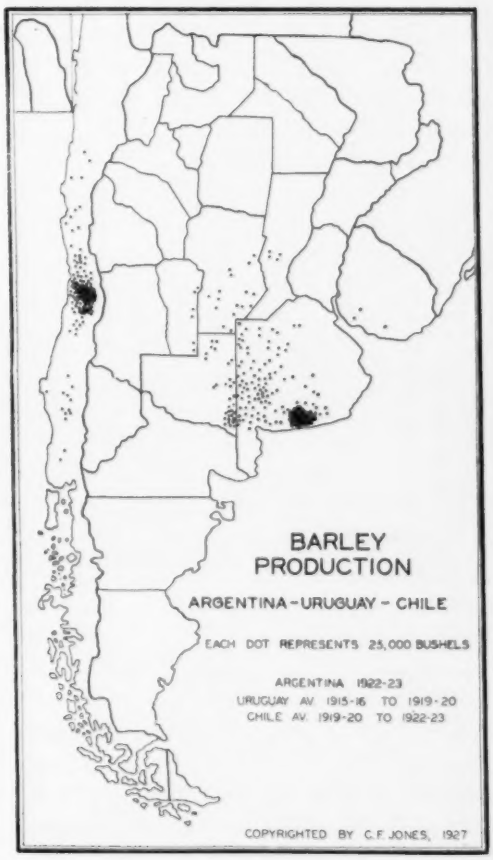


FIGURE 11.—Although barley grows throughout the wheat belt, the greatest area of production lies in the south-eastern corner, the coolest, more moist section. The great density of production at this place results from the great demands of the breweries. (Argentina, *Estadistica Agro-Pecuaria*, Mayo, 1923, p. 201–207, Ministerio de Agricultura de la Nacion; Uruguay, *Anuario Estadistico*, Director General de Estadistica Annual, Montevideo; Chile, *Anuario Estadistico de la Republica de Chile, Agricultura*, Año 1919–20 to 1924–25, Santiago.)

steadily increases, in rotation with wheat, and to supply the breweries (Fig. 11). Although rye is well suited to soil and climatic conditions of the Wheat Crescent, it has not assumed large import; it occupies only one-fourth of a million acres throughout the region.

YIELDS OF WHEAT

Yields of wheat are only moderate; Argentina has a yield of only 12.1 bushels per acre (average 1922–1925) compared to that of the United States of 14.2. Improvement over earlier years increases; the average yield for 1909–1913 was only 9.2 bushels. Poor agricultural methods, in many sections, owing to lack of skill and initiative on the part of the *medianeros, arrendatarios* and even the land owner, droughts, frosts, heavy rains, and locusts induce low yields. La Pampa best illustrates the effects of drought and frost, Córdoba and Santa Fé of locusts, Santa Fé of rains at harvest time. Heaviest yields are obtained in Buenos Aires, 12.4, and the lowest in La Pampa, 9.5.

MOVEMENT OF THE CROP

Huge two- or four-wheeled carts with wheels frequently eight feet in diameter transport the grain from farm to railroad. Loaded by hand, each holds from four to six tons of wheat sacked in jute bags of 136 to 143 pounds (Fig. 12). Regular teamsters, who base their charges on the length of the haul and the condition of the roads, do much of the hauling. The average haul is nine to ten miles, and the maximum which still yields an ultimate profit, 25 miles. At the stations the bags, stacked in immense heaps, frequently in the open, are covered with waterproof canvas.

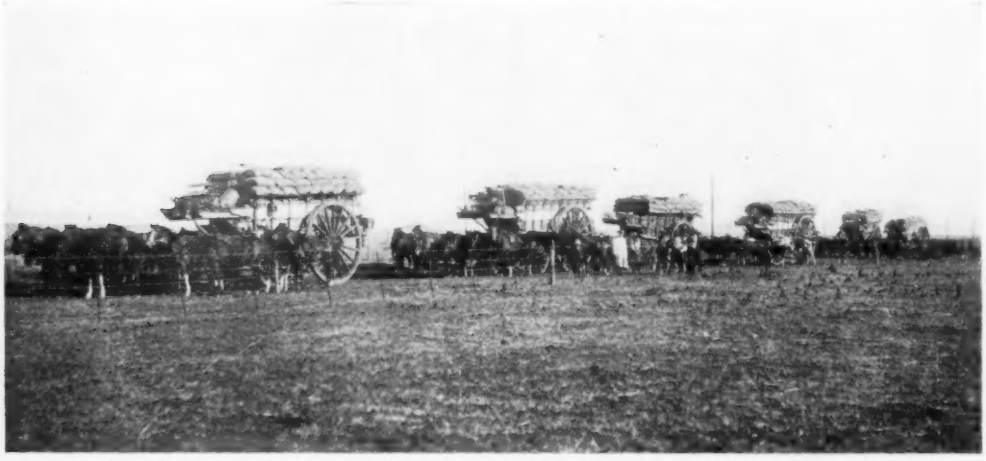


FIGURE 12.—Horses, mules or oxen furnish the motive power for the huge grain carts that move the wheat from farm to railway; regular teamsters charge for the haul on good roads 1.735 cents per bushel for the first lap of 3.1 to 3.2 miles, for the second, third and fourth, 1.15 cents and for the rest .694 cents. (Photo by H. G. Olds.)

Without navigable rivers, the Wheat Crescent depends upon a fair network of railways, although different gauges exist and some sections lack feeder lines. The region lies near the sea compared to the wheat regions of the United States,[3] but the rates are high; yet the short rail haul gives

[3] Nowhere is the haul to one of the ports more than 391 miles; very little grain anywhere in Argentina is transported more than 300 miles.

Argentine wheat an average margin of eight to ten cents per bushel over American wheat in the combined rail and ocean haul to Liverpool.

Wheat in Argentina, in contrast to that in the United States, is primarily an export crop, two-thirds of the production going to foreign markets. The sparse population of the country and wheat farming on an extensive scale with labor-saving machines of all kinds enable the country to produce a large surplus, and the location of the Wheat Crescent within 300 miles of a river or an ocean port means low transportation costs compared to those of Canada or the United States, where the export wheat grows a thousand miles from the sea.

EXPANSION OF WHEAT CULTURE

Wheat production in Argentina has large possibilities; it will not be confined to the Wheat Crescent; it spreads over into most of the adjacent regions. Argentina has 225,000,000 acres physically adapted to wheat culture; with thirty per cent of this land yielding wheat at thirteen bushels per acre, the country could produce 900 million bushels.[4] While the country has large possibilities, a long time will elapse before its crop mounts even to two-thirds of this figure. For years most of the crop will come from the present Wheat Crescent.

THE CORN-FLAX REGION

The Corn-Flax region of Argentina from the great bend of the Paraná extends to the south and west for about 120 miles. It includes northern Buenos Aires, southern Santa Fé and a strip of eastern Córdoba—the heart of the extensive Pampa. Corn, the chief crop of the region, has spread from Rosario into the domain of pure-bred cattle and into the Wheat Crescent, yet it has not penetrated the area east of the Paraná river, owing to the lack of adequate transportation facilities, to a wide belt of poorly drained land, and to the persistence of the vast cattle *estancias*. The region by its location on the Paraná has easy access to the Atlantic, a marked advantage over the Corn Belt of North America, most of which lies a thousand miles from the sea. Although the region is only 120 miles wide and 250 miles long with an area of 30,000 square miles (19,200,000 acres or about 2.5 per cent of the area of Argentina) it has lifted the country to first place as an exporter of corn and linseed; Argentina supplies 66 per cent of the world's exports of corn and 72 per cent of those of linseed.

PHYSICAL CONDITIONS

The Corn-Flax region receives from 28 inches of precipitation in the west and south to 38 inches on the eastern margin, a rainfall well sufficient for the demands of corn. An early summer maximum during November to January of 9 to 12 inches gives the highest yields; but a second maximum coming in March and April, at the ripening and harvesting period (Figs. 1, 3–6), combined with mild temperature, causes a great deal of the corn to spoil in the field or in the *troje* or enroute to the sea (Fig. 13). While the rainfall in general favors corn culture, marked fluctuations in seasonal distribution and amounts present great handicaps; most of the years of low production correspond to periods of drought.

Drought becomes a double menace

[4] Jones, Clarence F., "Argentine Trade Developments," *Economic Geog.*, Vol. 2, No. 3, p. 374, 1926.

FIGURE 13.—In contrast to the cereal regions of North America, all grain in Argentina is handled in jute bags from the machine to the steamer. The lack of elevators and the inadequate sheds for storing the grain at railway stations in rainy seasons allow much grain to spoil or to arrive in the market in very poor condition. Storage sheds of galvanized sheet iron are being constructed at most of the railway stations, but as yet these can store only a small part of the crop. (Courtesy of H. G. Olds.)

to the farmer of the Corn-Flax region, for a dry season usually brings the locust in incredible numbers. Coming from the Chaco and the *Monte* from the north and west, the locust arrives when corn is most susceptible to attack, at the time when the plant is green and the ears soft. Corn is the favorite food, for the wheat has ripened and the flax usually has been gathered, yet most forms of vegetation suffer; only the *paraíso* tree, planted along the roads and between farms, enjoys comparative immunity. While the government spends from one to five million dollars annually in combating locusts, the scourge continues, especially in dry years.

Favorable temperatures prevail; the summer average for the entire region ranges between 71° and 75°. Although these correspond to the summer temperatures of the Corn Belt of the United States, the optimum conditions in the Corn-Flax region seem to be slightly below the normal.[5]

In the south the growing season for corn extends from early November to late March, and in the north from early November to late April. Winters are mild, permitting plowing throughout that season. At the same time the light winter rainfall results in a lesser leaching of the soil than would be the case in a region of heavier rainfall.

The soils of the Corn-Flax region constitute the best soils in Argentina; typical dark brown to black silt to clay loam soils, they contain much humus and are free from stones and stumps, and do not have the hardpan layer like that of the soils in the region to the west. They are easily tilled and the gentle relief plus the location near ocean transportation combine with rainfall and temperatures to make the Corn-Flax region the most arable portion of the country.

THE USE OF THE LAND

Of all sections of Argentina, the Corn-Flax region has the largest number of products contending for the use of the land; they include corn, wheat, flax, alfalfa, cattle and swine, but corn dominates (Fig. 14).

[5] Hoxmark, Guillermo, *El Maíz en la Argentina, los rendimientos y las condiciones climatéricas. Sección Propaganda e Informes, Ministerio de Agricultura*, No. 697, pp. 1–44, June, 1927.

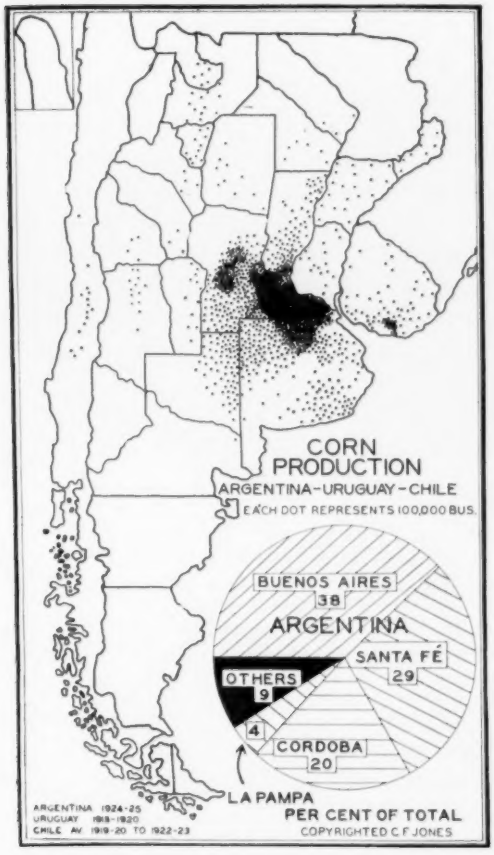


FIGURE 14.—While corn may be grown in many parts of Argentina, its commercial production is confined to a district within 200 miles of water transportation. The region corn dominates extends for only 120 miles to the west and south of the great bend of the Paraná. (Argentina, *Estadistica Agro-Pecuaria, Juno*, 1925, pp. 407–409, *Ministerio de Agricultura de la Nacion* Buenos Aires; Uruguay, *Anuario de Estadistica Agricola, Ministerio de Industrias*, Annual; Chile, *Anuario Estadistico de la Republica de Chile*, Año 1919–20 to 1924–25, Santiago.)

CORN

Of the acreage in crops in the Corn-Flax region, corn occupied 52 per cent in 1924–1925; in the zone for 50 miles west of the Paraná corn occupies nearly two-thirds of the entire area; the acreage of corn in this region constitutes 68 per cent of the area planted to corn in the Republic.

The corn of Argentina consists almost entirely of the flint type, which has a marked preference in the markets of northwest Europe, although it may sell for 8 to 10 cents more per bushel than that from the United States. This preference results from (1) smaller kernels, making it better adapted to poultry feeding; (2) sweeter meat, making it in demand for horse feed; and (3) three to four per cent less moisture, so that it ships well and will keep in good condition longer.

Argentine flint corn consists of two types: white and yellow. The white varieties, *Morocho* and *Perla* are not so widely cultivated as the yellow. *Morocho* has smooth flinty kernels, much smaller than the white dent of the United States, while *Perla* grows ears and kernels one-half the size of *Morocho*. *Maiz de harina*, flour corn, having light yellow kernels and very starchy, grows in the north. Other yellow varieties include *Canario, Húngaro, Cuarentón*, and *Lombardo*. *Cuarentón* with a small flat kernel of fine appearance dominates; it is unexcelled as poultry and pigeon feed.

In spite of a preponderance of the flint varieties of corn the dent types have been introduced; they are adapted to the climatic conditions of the region and give high yields, although they require several more days in which to mature. Yet, they are better for hog and cattle feed than the flint varieties.

CORN AND HOGS

Although corn in Argentina is primarily an export product, the increasing numbers of swine in the Corn-Flax region form the basis of an important industry (Fig. 15). The region has one-third of all the swine in Argentina; they feed on both corn and alfalfa, both of which are abundant. Mild winters obviate the necessity for shelters; the farms and

FIGURE 15.—Although swine are quite generally distributed in Argentina their great concentration is in the Corn-Flax region. (Argentina, *Tercer Censo Nacional, Tomo VI, Censo Ganadero.* Oficina Estadistica, Buenos Aires; Uruguay, *Estadistica Agricola* Año, 1916, *Ministerio de Industrias*, 1917; Chile, *Anuario Estadistico de la Republica de Chile*, Vol. VII, Año 1919–20 to 1924–25.)

packing plants lie near ocean ports; hogs may be raised more cheaply in Argentina than in the United States and pork products can be delivered to the eastern seaboard of the United States at lower prices than they can from Iowa. Yet swine in Argentina number only one and one-half million; progress has been slow, owing to the lack of a great pork-eating population, and to more labor required in the industry than on an extensive cattle *estancia.*

WHEAT

Wheat both in acreage and production ranks next to corn; it occupies about one-fourth of the land in crops. The densest area of production lies in southwestern Santa Fé, where corn in its westward extension from the Paraná has not displaced it. In this section the two are rotated, both benefiting from the practice; the highest yields of corn and wheat in Argentina are in this section of the Corn-Flax region. But gradually, wheat is being replaced by corn.

FLAX

While flax commands a smaller acreage than wheat, it holds a more important place in the Corn-Flax region as a whole than wheat; in some departments its acreage nearly equals that of corn (Fig. 16). It is produced especially as a first-year crop in preparation for alfalfa range. It is especially valuable for the latter use for several reasons. Its drought and heat resistant qualities make it an admirable crop for the Pampa. Yields are high—10 bushels per acre in the Corn-Flax region, a 20 per cent greater yield than in the United States. Its short tap root creates a heavy drain upon the fertility of the upper soil and its liability to disease further favors its culture on range land. Furthermore, wealthy land owners wishing to increase their acreage of alfalfa rent land for three or four seasons for flax culture to immigrant farmers, who at the end of the period leave the land in alfalfa—a cheap way of getting alfalfa pasture.

In rotation with corn, the peak labor requirements for flax come at different periods than those for corn; it is sown in May to August and harvested from November to December.

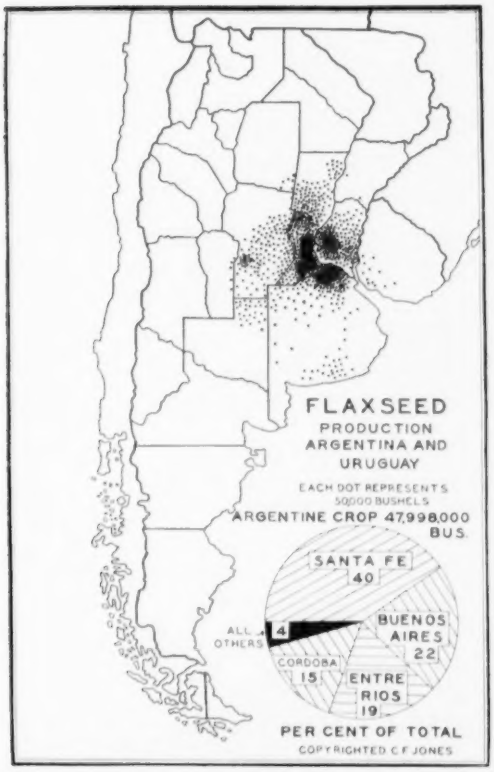


FIGURE 16.—The chief flax areas in Argentina lie in the Corn-Flax region and in Entre Ríos, near deep water transportation. On the outer margin of the cereal regions it grows on virgin soil which is being converted into crop land or high grade alfalfa range (Argentina, *Estadistica Agro-Pecuario*, May, 1923 and June, 1924; Uruguay *Anuario de Estadistico Agricola*, Director General de Estadistica, Annual).

ALFALFA AND CATTLE

While alfalfa is grown throughout the Corn-Flax region, cattle are noticeably fewer than in the grazing regions to the north and south and even in the Wheat Crescent to the west. Starting along the Paraná near Rosario, the chief outlet of the region, corn has slowly invaded the domain of pure-bred cattle, replacing them in large part.

METHODS OF PRODUCTION AND LAND TENURE

Owing to the open winters plowing the land takes place in June to August, a season of low labor requirement and at a time when the work animals can best stand heavy work because of low temperatures (Fig. 17). In the north planting begins in August; south of Rosario the season extends from September 15 to January 1, although most planting is done between October 1 and December 15. In regions more likely to be attacked by the locust, the corn is planted earlier, so that a later planting may be made if necessary.

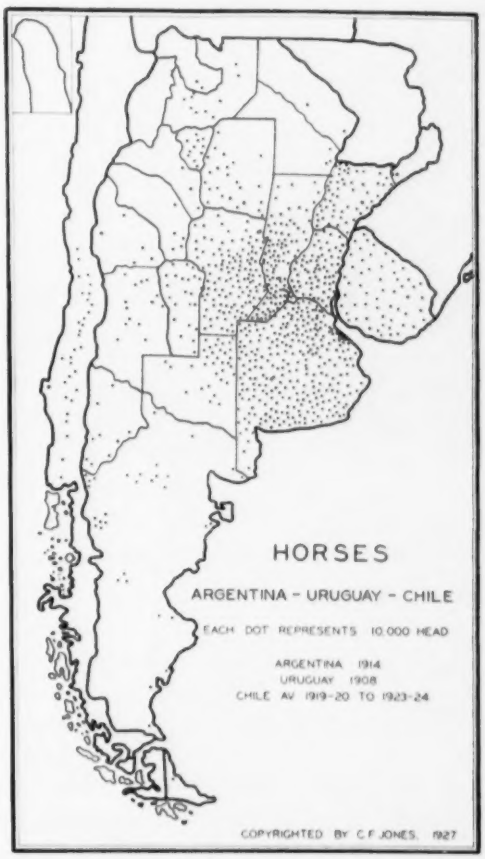


FIGURE 17.—Horses, used for power in the cereal belts, and for general work on the *estancias*, are generally distributed over the Pampa. The slightly greater density of dots in the Wheat Crescent and the Corn-Flax region indicate their use in farm work (Argentina, *Tercer Censo Nacional, Tomo VI, Censo Ganadero, Oficina Estadistica, Buenos Aires;* Uruguay, *Estadistica Agricola*, Año, 1916, Ministerio de *Industrias*, 1917; Chile, *Anuario Estadistico de la Republica de Chile, Tomo*, VII, Año, 1919–20 to 1924–25).

Many of the small farmers in the north sow much of the seed broadcast, yet on the whole drills are common—the preferred type, a 3-row disc drill with width between drills of 26 to 36 inches. The corn is not checked, so that cultivation is in one direction only. Drilled corn receives two plowings with the straddler cultivator; corn sown broadcast receives no cultivation.

The harvest season reaches its height in April and May, the corn being shucked from the standing stalk by contract workers and placed in sacks or baskets which are carried to the *trojes* or cribs (Fig. 18); these men go from farm to farm.

FIGURE 18.—Most of the corn is shelled by the large steam propelled cylinder, which moves from farm to farm, doing the work on a percentage or cash basis. Corn stored in a wire-corn or cane-stalk *troje* may keep for five months in good weather, but during wet seasons much of the corn may spoil because of poor aeration and high temperatures. In a country of small timber resources it is difficult if not impossible to procure lumber for cribs. After the corn is shelled it is stored in sacks in huge piles to await transportation to railways and to ports. (Courtesy H. G. Olds.)

Yields per acre for the ten-year period, 1914–1915 to 1923–1924, averaged 24 bushels. Santa Fé farms produced more heavily than others, 26.4 bushels per acre. Poor methods of cultivation, locusts, droughts, and rainy-hot weather at harvest time keep down the average yields on a friable fertile virgin soil.

TRENDS OF LAND TENURE

The huge *estancias*, cattle estates which formerly held complete sway, are giving way in the face of corn culture by the immigrant class, a more profitable use of the land. In 1914 there were 76 thousand *Chacras* in all the cereal provinces; of these, 56 per cent were operated by *arrendatarios*, 12 per cent by *medieros*, and 32 per cent by proprietors, who had accumulated sufficient capital to purchase a *Chacra*. Southern Santa Fé and northern Buenos Aires—the Corn-Flax region—contained the largest number of small farms; Córdoba and La Pampa—the Wheat Crescent—the greatest percentages of renters.

In 1924, the number of *Chacras* in the cereal provinces totalled 120 thousand. Seventy per cent of these holdings contained between 25 and 250 acres; wheat grew on 23 per cent of the *Chacras*, linseed on 19 per cent, and corn on about 58 per cent, thus indicating the dominance of small

land holdings in the Corn-Flax region. Furthermore, it is to these immigrants who work hard and live miserably on these small *Chacras* in the Corn-Flax region that Argentina owes its importance in the corn and flax trade of the World.

The annual exports of corn rose from 28 million bushels in 1900 to 150 million for the last two years; flax from 10 to 50 million in the same period. Large areas physically suited for corn culture await capital, machinery, and labor to bring about a great harvest. However, corn in Argentina may not continue to be primarily an export product for a swine industry and possibly of that of cattle, based on corn and giving a more intensive type of land use, will consume more and more of this crop. This will intensify the Corn-Flax area as an agricultural region.

THE EASTERN PAMPAS GRAZING REGION

The Eastern Pampas Grazing Region, occupying much of the great province of Buenos Aires, borders the Wheat Crescent on the south and west, and the Corn-Flax and Dairy Specialized Farming region on the north. Placing Argentina in the front rank as a great cattle and sheep country, in the early days, it still clings tenaciously to the grazing industry more than three centuries old. Although corn, flax, and wheat have encroached upon the margins of the region, vast *estancias* embrace most of Buenos Aires and their products dominate the province. The region is one of the most advanced pastoral areas in the world, grazing excellent breeds of cattle, sheep, and horses.

THE PHYSICAL CONDITIONS

Climate, natural vegetation, relief, soil, and economic conditions combine to give grazing the dominant rôle in the eastern Pampa.

CLIMATE

Short mild winters and warm summers characterize the region. Gentle refreshing breezes alleviate the heat of the summer days and operate the omnipresent windmill. Mean summer temperatures average 72° in the northwest and 66° in the southeast; mean winter 50° and 46° respectively. Minimum temperatures are high; open winters permit grazing throughout the year, making unnecessary expensive stall feeding, and allowing steers to go onto the market a year younger than those in the Corn Belt of the United States.

The average annual rainfall ranges between 40 inches in the northeast and 25 inches in the west. Although a maximum occurs in early autumn (March), the rainfall is fairly evenly distributed throughout the year, giving a good growth of grasses through a long season, keeping the water table high and affording, at shallow depths, an abundant supply of water, brought to the large tanks on the surface by windmills on every *estancia*. However, drought is a menace in the western part.

NATURAL VEGETATION

The excellence of the native vegetation of the Pampa formed another basis for the creation of the Pampean grazing industry. Perennial hard grasses comprise most of the native vegetation. Of the bunch types, *pasto duro* is most common, but owing to grazing it has been succeeded in many areas by *pasto tierno*, or *dulce*, which includes fine grasses of annual species and leguminous types, chiefly of European origin. Other native forage plants include various species

of clover, *medicago*, legumes, bluegrass, and rye grass.

In the swales of the vast undulations of the Pampa, beautiful flowering plants, as *Portulaca*, *Verbena*, and some of the *compositae* thrive; they are excellent for grazing. The dense tufts of stiff grasses, species of *Stipa* and *Melica*, grow on the low sandy loam ridges. Troublesome plants include various thistles, foxtail, cocklebur, Bermuda grass, mustard, and chicory.

Only two native trees inhabit the Pampa of the east. The *ombu* (*Phytolacca dioica*), a stately tree, individually isolated, forms a prominent landmark; its wood is soft and useless, yet it provides shelter for man and beast. The *ceibu* (*Erythrina cristagalli*), a lowland tree, is greatly branched, generally deformed, and rarely exceeds twenty feet in height. Its dominant habitat is the delta region of the Paraná.

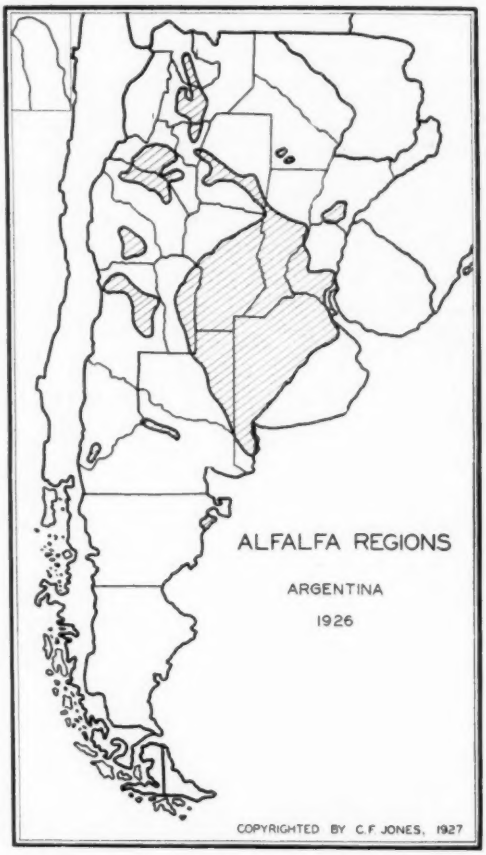


FIGURE 19.—Alfalfa occupies more land than any other crop in Argentina; the alfalfa area in 1924 amounted to one-third the total area in crops. The extension of alfalfa range has been basic to the development of the modern cattle industry of the country. It does not grow in the eastern part of the province of Buenos Aires owing to vast areas of low, wet clay lands in the eastern margin and to a *tosca* or hardpan layer near the surface in the southern portion. The eastern limit of alfalfa is marked by a line from La Plata to Bahía Blanca.

RELIEF AND DRAINAGE

In general the surface of Buenos Aires is slightly undulating and without noticeable relief features except for a low range in the southeastern part, 80 miles wide and 150 miles long. Río Salado, the only noteworthy stream, rises in southern Santa Fé, and seeps its way through vast marshes in the Pampa to the ocean; a curious stream with no perceptible current, it consists of a succession of lagoons and marshes; its width varies from a few feet to miles according to the season and the rainfall. On the south it has a number of tributaries similar in character. South of Río Salado much of the country consists of low, flat, swampy swales and drier sandy swells; this type of surface favors grazing since each area supports different species, while it does not lend itself to cultivation. Many lakes and swamps dot the surface of the whole Eastern Pampas Grazing Region, rendering millions of acres unfit for cultivation as the inundated areas increase greatly in size during rainy periods. While large areas may be drained, it will be a long time before economic pressure in a country of cheap land brings about extensive drainage undertakings.

SOILS

Between the Río Salado and the Corn-Flax region on the north and the low range of hills and the Wheat Crescent on the south, most of the soils are fine in texture; they are free from stumps and stones, yet only the drier and more sandy and sandy loam areas favor tillage and the growth of alfalfa. The heavy clay soils which cover extensive areas of low lying lands are not good for alfalfa, neither do they favor cultivation. In the south, extensive areas of *tosca* or hardpan close to the surface, especially in Azul and Tandil, prevent the growth of the prize forage (Fig. 19). In the eastern margin of the Pampa, low wet clay lands restrict alfalfa; on the other hand the greater precipitation and its even distribution through the year afford excellent native forage. In the more dry and coarser textured soils of the western half of the region, alfalfa finds a prominent place on all the up-to-date *estancias*.

PASTORAL PRODUCTS

The Eastern Pampas Grazing Region is a land of pure-bred cattle and fine sheep, a land of chilled beef, mutton, wool, hides, and skins.

CATTLE

In 1816, a traveller, witnessing the hunting of wild cattle and horses for hides, remarked, "The real wealth of the province of Buenos Aires was, and always will be, the trade in hides." In 1922 the province pastured 15,507,000 cattle, more than 40 per cent of the total of the Republic (Fig. 20), which provided the bulk of more than 50 per cent of the world's exports of beef. In 1925 half of the trade consisted of young chilled beef, the best commercial type, which enters the select English markets. The quality of cattle steadily increases (Table I).

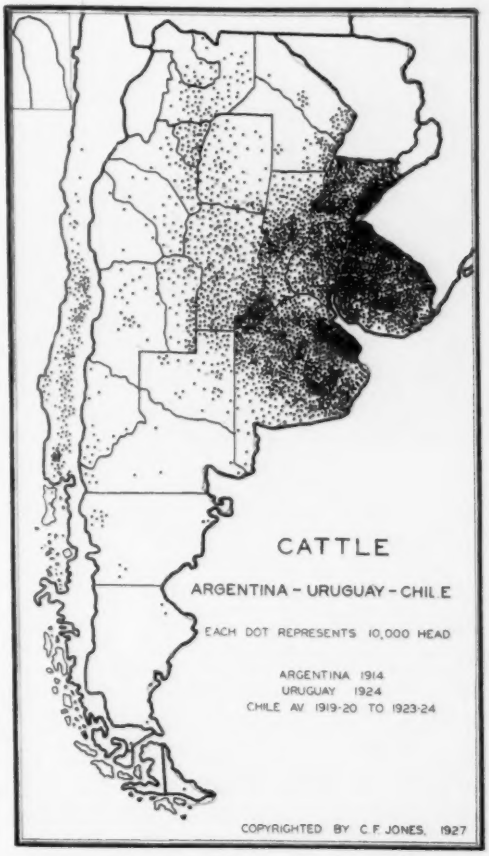


FIGURE 20.—Nearly two-thirds of the cattle of Argentina graze in three regions—the Eastern Pampas grazing region, the Paraná—Uruguay region, and the Dairy-Specialized-Farming region. Cattle are fairly evenly distributed in Uruguay, except for the farming region along the Rio de la Plata. In Chile cattle are confined largely to the central valley (Argentina, *Tercer Censo Nacional, Tomo VI, Censo Ganadero,* Oficina Estadistica, Buenos Aires; Uruguay, *Stock Bovino,* Año 1924, *Oficina de Economica y Estadistica Agricola.* Ministerio de Industrias, Montevideo, 1926; Chile, *Anuario Estadistico de la Republica de Chile Tomo VII,* Año 1919–20 to 1924–25, Santiago).

TABLE I

CATTLE IN ARGENTINA

Year	*Native*	*Mixed Breeds*	*Pure Bred*
1888.....	17,574,572	3,388,807	37,858
1914.....	10,211,299	15,275,689	379,775
1922.....	6,492,019	29,549,234	1,023,597

The improvement of the stock in the country has progressed most in the grazing region of Buenos Aires.

FIGURE 21.—Imported pure-bred stock from the United Kingdom and the United States during the present century has been a prime factor in the evolution of the cattle industry of Argentina. Young high-grade cattle when fattened on alfalfa dress into first-class chilled beef that competes with corn-fed beef from the United States.

Of the pure-bred types, the Durham, completely acclimated, is the most numerous. Yet in areas of harsher grasses and less favorable climate, the Hereford and Aberdeen Angus dominate (Fig. 21).

Factors contributing to the improvement of the cattle of the Pampa include: the provision of ample pure water for the stock; the fencing of ranges and thus the separation of young animals, the breeders, and the feeders; the importation of pure-bred stock for breeding purposes; and the conversion of native pastures into excellent alfalfa range.

In the early days droughts were a double menace, for pastures not only failed but the water supply gave out, causing the death of millions of animals. Now the tall windmills are a striking feature of the landscape. At the base of each a huge tank stores millions of gallons of water, which insure a water supply in period of drought and at times when the windmills stand motionless for want of a driving breeze.

When cattle roamed at will, it was a difficult task, if not impossible, to regulate breeding. At present fine fences of seven to nine wires, the upper one or two barbed on *quebracho* or *algarrobo* posts twenty-five feet apart constitute an essential part of every *estancia*. With them the cattle are separated, graded and shifted from one range to another as the stage of the breeding cows and the feeders, or as the conditions of the pasture indicate. Overgrazed areas are thus allowed to recuperate instead of having the cattle nip every new blade of grass is it appears above the ground; feeders are shifted to better and better range as they approach a marketable condition.

The importation of pure-bred stock for breeding purposes, first from the United Kingdom and later from the United States, lies at the base of the great evolution of the beef industry of the Pampa. Native scrawny, bony, creole cattle are fit only for extract, *tasajo*, or low-grade frozen beef; pure-bred cattle finished on alfalfa range dress into the best of chilled beef, which competes with corn-fed beef from the United States.

Alfalfa, another factor of prime im-

portance in this region, has made profitable the use of millions of acres of land that would otherwise be relatively unproductive. The light porous soils of the middle Pampa form its best habitat, but it has spread far and wide. It occupies more land than any other crop in Argentina, amounting in 1924 to almost 20 million acres or more than one-third of the land in crops.

Alfalfa has many advantages: (1) Alfalfa range is worth about four times as much as the best combination of native summer and winter grasses. Normally in the Eastern Grazing region four to seven acres of native grasses are required to support one full-grown steer, whereas alfalfa range supports one animal on every one and one-half acres. (2) It, combined with year-around grazing, sends the steer to market a year younger than the native pastures. (3) From one planting it furnishes unexcelled forage for five to eight and even eleven years in some sections, and may be cut three times a year. (4) In the late summer, when the native grasses dry up, the alfalfa, because of its deep roots, remains luxuriously green. (5) Its nitrogen-fixing capabilities have enriched the soil of extensive areas. So valuable is it to the cattle industry of this region that on a single estate of 40 to 50 thousand acres, more than half of the *estancia* may grow this flesh-making forage.

Alfalfa is supplemented by other forage crops. *Cebadilla*, native rye-grass, and Sudan sorghum are widespread. Oats, sown during the latter part of the summer, supply green forage throughout the mild winter months; in the spring much of the crop may be left to ripen as a grain crop or as hay for reserve feed. Yet in the Province of Buenos Aires nearly one-third of all the oats sown is used for winter grazing only.

Despite various kinds of forage the Eastern Grazing Region seems to have practically reached its maximum carrying capacity but much room remains for the improvement of the quality of the stock through breeding, the provision for shelter from the cold rains of winter, supplying more water in times of drought, and by finishing off beef cattle with corn, a practice not much employed at present.

SHEEP

In 1840 the first shipment of wool left Argentina; during early years the vast areas of cheap temperate pasture lands and the small population in Argentina, with the increasing demand for wool to supply the textile mills of northwestern Europe, gave optimum conditions for the development of an extensive sheep industry on a gigantic scale. Moreover, wool, being easily prepared and transported to market without appreciable deterioration, constituted a product suited to the means of transportation of the times. Most of the sheep were Merinos; early they were of so little value for mutton that they were slain, the wool being pulled from the bodies, which were left for dogs and buzzards, or frequently burned as fuel.

The numbers of sheep increased rapidly at the hands of the Basque and Irish shepherds until near the close of the nineteenth century. In 1889 Buenos Aires grazed 51 million sheep; in 1895, 52 million; in 1914, 19 million; and in 1922 only 12,902,000. At present sheep-grazing scarcely exists at the point where it had its origin in Argentina, to the east of

Río Salado, because crop agriculture and dairy farming near the centers of population caused them to seek the western and southern lands (Fig. 22).

At present all the sheep of the Eastern Grazing region consist of mutton breeds; the substitution of Lincolns for the old Merinos is complete. The former, originally bred on the moist downs of England, are well adapted to the wet eastern Pampa. Modern packing plants at the large ports have aided in driving the wool sheep to the far arid west and the cold south. Other breeds include the Romney Marsh, whose natural habitat was marsh land, Oxford Downs, and the Australian Merino.

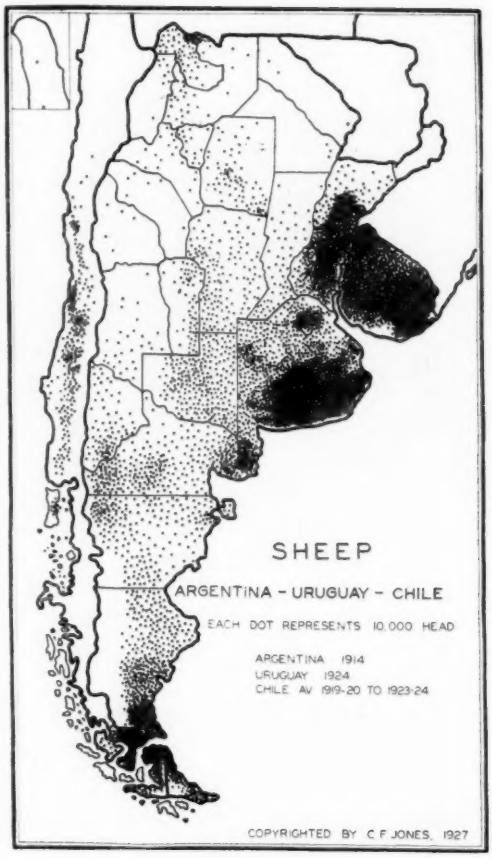


FIGURE 22.—Most of the sheep of Argentina are grazed in three districts—Southeastern Buenos Aires, Entre Ríos—Corrientes, and Patagonia—Tierra del Fuego. Sheep are evenly distributed over Uruguay except along the Rio de la Plata. In Chile they thrive in the Central Valley and in the Punta Arenas region (Argentina, *Tercer Censo Nacional, Tomo VI, Censo Ganadero, Oficina Estadistica,* Buenos Aires; Uruguay, *Stock Ovino en el* Año 1924, *Seccion de Economica y Estadistica Agricola, Ministerio de Industrias* Montevideo, 1926; Chile, *Anuario Estadistico de la Republica de Chile, Tomo VII,* Año 1919–20 to 1924–25, Santiago).

THE *Estancia*

The huge profits obtained by the raising of cattle and sheep on an extensive scale and the increasing value of the land have preserved most of the vast *estancias* of Buenos Aires from the inroads by agricultural colonists. At one time more than thirty per cent of the best land of the province was held by 93 proprietors. In 1917, 328 estates each embraced more than 25,000 acres. These large *estancias* afforded the necessary pasturage under one management. They gave, through the enormous profits from cattle or sheep raising on a gigantic scale, typical of the region, the funds sufficient to provide a comfortable *quinta* and living for the *estanciero* and all the members of his family, to educate the children in France or England, to furnish a luxurious *villa* in Buenos Aires, to introduce at great expense pure-bred stock, and to regulate breeding and grazing, prime factors in the development of the great pastoral industries.

TRENDS

Although corn and flax have invaded northern Buenos Aires, dairying and mixed farming the region east of Río Salado, and wheat the southern part of the province, it seems that the great central portion of the province is destined to remain primarily a grazing region of vast *estancias*, a land of excellent beef cattle and fine mut-

ton sheep. Of low relief, the poorly drained lake and swale dotted country, the clay loam and heavy clay soils, the even distribution of moisture throughout the year, the vast areas of alfalfa, and the luxurious growth of native lowland forage plants favor the grazing industry and hinder the expansion of agriculture. While vast areas may be drained, it will be a long time before economic pressure brings about large drainage projects. The landed aristocracy, a small class having wealth, leisure, and power, do not want the agricultural immigrant, while the native laborer in this region prefers a life in the saddle to one of hard labor in the fields. Thus geographic, economic, and social conditions point to the permanency of the Eastern Pampas Grazing industry.

LA PLATA DAIRYING—SPECIALIZED FARMING REGION

Bordering the shores of the Río de la Plata is a region of dairying and specialized farming, differing markedly in agricultural products, from the adjacent grazing lands of either the Pampa of Argentina or Central Uruguay. The region includes a strip about fifty miles wide from south of La Plata to the north of Buenos Aires, one about thirty miles wide from east of Montevideo to the mouth of the Uruguay, and the fertile islands of the delta of the Paraná. It expanded slowly into the vast pastoral domain of former years as urban centers grew and increased their demands for foodstuffs. In Argentina it supplies chiefly dairy products, fruits, and vegetables; in Uruguay it embraces much of the crop land of the country, and supplies dairy products, grapes and wine, wheat, corn, vegetables, and fruit.

The region as a whole is one whose boundaries, products, and types of farming are determined by economic factors, rather than any difference in physical conditions, except possibly the small area in the delta of the Paraná. Physically, both shores of the Río de la Plata consist of narrow slices out of the greater Pampa of Argentina and Uruguay. In relief, soil, and climate they are similar to the vast expanse of land to west and north. Only location, transportation, and market make of the shore strips a different agricultural region. In early days they were held in vast estates and grazed sheep and cattle like the rest of the region, but the growth of cities, ports, population, and means of transportation has broken up the large land holdings, chased the sheep and cattle to more distant ranges, and established a different system of agriculture.

Although the region embraces only a speck of the great country of Argentina and a narrow slice of Uruguay, it holds a significant place. Within its borders dwell one-fourth of the population of Argentina and nearly two-fifths of that of Uruguay. Far reaching railways converge on the chief cities, yet most of the dairy products, vegetables and fruits, except grapes and citrus fruits, consumed by the urban population, comes from this region.

DAIRYING

Not many years ago Argentina presented the striking anomaly of a great cattle country, which produced little milk or butter. Before the war much of the urban population depended upon European condensed milk, tinned butter and cheese from Italy. The war cut off the source of supply, giving a great impetus to the

domestic industry, which had been established in a small way in many parts of the country by Galician Spaniards, Basques, and Italians. Not only did the home industry supply domestic demands, but the exports rose to considerable figures (Fig. 23).

Dairying has reached its greatest development in the small region, near Buenos Aires, near a large domestic market and a great port, and in an area having rapid transport. Here a mild climate, and an annual rainfall of about forty inches evenly distributed throughout the year favor the growth during most of the year of luscious grasses, a prime factor in a high yearly yield of milk per cow. This small district has about 27 per cent of the dairy cows of Argentina (Fig. 24); in it most has been done to improve the quality of the herd. Although Holsteins are the favored breed, Jerseys have been introduced. The region has one-third of the cream stations of the country, two-thirds of the butter factories, one-fifth of the cheese factories, and one-third of the combined butter-cheese factories. The *province* of Buenos Aires and Capital Federal produced, in 1920 and 1921, 73 per cent of the milk of the country, 78 per cent of the butter, and 66 per cent of the cheese.

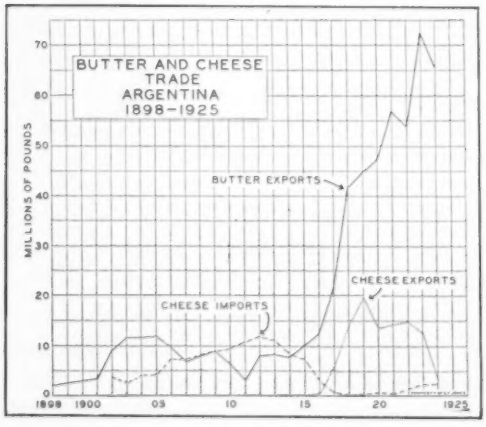


FIGURE 23.—The Butter and Cheese trade of Argentina 1898–1925. Casein exports, not shown on the graph, rose from 11 million pounds in 1917 to 43 million in 1926.

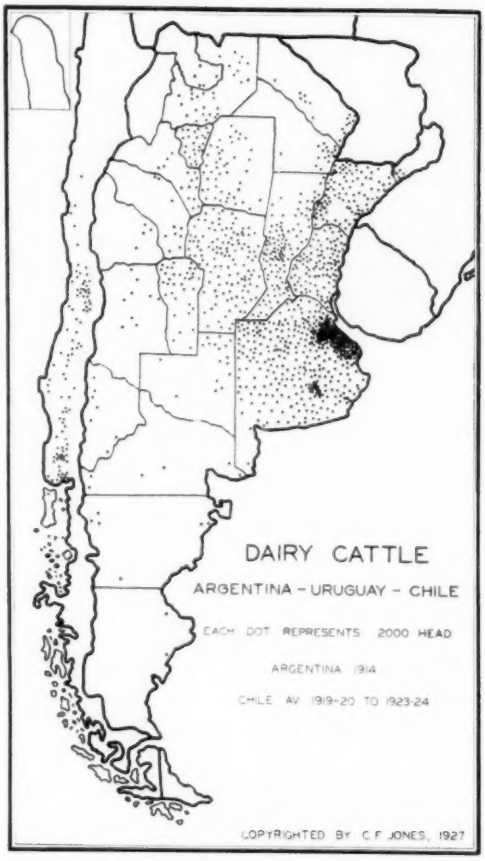


FIGURE 24.—While dairy cows are widely distributed over the settled areas of Argentina, they are greatly concentrated near Buenos Aires; a second point of concentration is near Tandil, a region settled by the Basques. In Chile most of the dairy cows are in the Central Valley (Argentina, *Tercer Censo Nacional, Tomo VI Censo Ganadero*, Oficina Estadistica, Buenos Aires; Chile, *Anuario Estadistico de la Republica de Chile, Tomo, VII*, Año 1919–20 to 1925–26, Santiago).

While many dairies of the most modern type are quite common, in general, few cattle are housed. They graze in the pastures throughout the year, and are milked in large corrals. Cows always on luscious grasses give fairly high yields, yet high yields of milk have not become the chief con-

cern of many dairymen, who consist of immigrants that have leased land on a large *estancia* for the production of milk. The dairyman contrives first to secure enough dairy products to make the leased land or farm pay as a dairy, while, at the same time, he trades as a pastoralist in a small way. With him a maximum yield of milk is not of primary consideration, providing that each cow rears a fine salable calf; the more cattle he can handle on the leasehold, the greater the income from this secondary source of revenue.

But a greater home market and foreign demand will bring about an improvement in the milk-producing breeds, a greater production of dairy products, and a clearer distinction in the dairy type of farming (Fig. 25).

In the Uruguay portion of the region no dairy statistics are available, but the decreasing imports of dairy products and a short trip beyond the outskirts of the towns in the area show the development of dairying near urban markets.

FIGURE 25.—A prize bull, the type of animal being employed to improve the dairy herds of Argentina; this picture was taken on Coqueta Estancia, Entre Ríos, but the bull was purchased on a dairy farm near Buenos Aires.

THE PRODUCTION OF VEGETABLES

Many vegetables—potatoes, cabbage, peas, lettuce, beans, tomatoes, radishes, and others—are produced in large quantities within a few miles of the chief cities of the region. On each day of the week one or more of the town market places is a scene of bustling activity as the gardener disposes of his products. The production of vegetables for the city market is the only type of farming in both Argentina and Uruguay where the small farm with rather intensive methods prevails. The gardening areas with farms of a few to 25 acres or more string out from the cities along the chief railways or lie around the suburban towns. Owing to fertile soil, long growing season, and an even distribution of moisture throughout the year, green vegetables may be supplied for much of the year. Nowhere in this region has a canning industry developed to provide a winter supply.

In Uruguay not only does this narrow strip of land produce most of the dairy products and vegetables of the country, but it contains nearly three-fourths of the two million acres, or four and one-fourth per cent of the area of the nation devoted to crops, 57 per cent of the wheat acreage, 48 per cent of the corn, 49 per cent of the oats, 55 per cent of the barley, and more than half the flax acreage. It represents the only portion of the country where the cattle lands of long standing have begun to give way to crop production, a movement that will gain momentum, once it is well under way.

FRUITS

As with vegetables most of the fruit, except grapes in Argentina and citrus fruits in both countries, is produced in this region. The more important fruits include peaches, quinces, apricots, plums, cherries, medlars, pears, and apples. In gen-

eral, they are grown on large estates by immigrant labor or on farms of 25 acres or less in the suburban areas of Buenos Aires and Montevideo.

The chief area of Uruguay extends to the north and east of the capital city. In addition it has most of the large vineyards of the country and produces much of the wine. To the west of the city the undulating south sloping lands receive the benefits of the sea breezes, an important factor in fruit production at times when early or late frosts might injure the fruit.

In Argentina four-fifths of the fruit trees, not including citrus fruits, are located within a distance of 200 miles of the metropolis. Few sections of this area present ideal conditions, for the rich but low and only fairly well-drained areas, subject to late spring frosts and high autumn winds, hinder fruit culture. Therefore, specially favored protected spots, along the river, produce the fruit. They include, in order from south to north along the Río de la Plata and the Paraná, La Plata, Guilmes, San Fernando, Tigre, Baradero, and San Pedro. The greatest area of all consists of the Tigre, the low island district of the delta of the Paraná. Some of the island district artificially made and drained, although subjected to overflows by high waters and by the tide, favors fruit production on account of its freedom from frosts. Also, it lies less than one hundred miles from Buenos Aires by rail or water. In contrast to other districts the fruit plantations of the delta, although not always in one unit, but owned by one individual or a company, range in size from 200 to 800 acres. The plantations grow the willows or poplars from which to make baskets, crates, or cases for fruit containers. Methods of planting, cultivation, and pruning are similar to those in the United States.

While the La Plata Dairying-Specialized Farming Region includes only a small area, agriculture will become more intensive within the region and the area will expand out into the pastoral domain and the cereal lands, as the countries develop and as the population becomes greater.

THE RED LAND OF GWENT IN EASTERN MONMOUTHSHIRE

E. Muriel Poggi

Geographer, University of Illinois

IN this short study an attempt is made to show the influence of soil conditions on human activities in one of the border counties between England and South Wales. The district is an interesting one, as it is a sparsely populated region of great beauty adjoining the South Wales Coalfield, one of the most densely populated industrial areas of the British Isles (Fig. 1).

A detailed study of the soils *on the ground* of this Old Red Sandstone Country, the area of which is designated vaguely as being "Old Red Sandstone and Cornstones," shows that while some soils of this formation are the poorest imaginable, others support some of the richest agricultural units. The distribution of the three main types of old Red soil and the effect that this distribution has on land utilization and other human activities, is illustrated here.

The Red Land of Gwent in Eastern Monmouthshire is little known, while the cities in the west of the county are world famous for their coal shipments and for tin plating and copper and iron smelting.

The Old Red Country in this area forms an undulating plateau west of the Wye dissected by the subsequent streams of the Trothy and Monnow, entering the Wye on its right bank, and the Red Brook and Mork Stream on the left bank, also the Olway Brook, with its headstreams, which drains southwest to the Usk. This plateau is highest on the east where Beacon Hill rises to over 1,000 feet and Trellech Hill is well over 900 feet. There is an abrupt drop to the Wye, to the east of which the Red Sandstone rises again steeply to heights of 700 to 800 feet and then dips under the Carboniferous Measures of the Forest of Dean.

The sinuous course of the Wye is one of the most striking features of the country. The Wye has always been a boundary from the time that Offa's Dyke was built to keep the Welsh back in their hills until the present day, when it marks the dividing line of parishes. One has only to travel along the river banks by the Wye Valley Railway from Chepstow to Monmouth and Ross to realize what a definite barrier the Wye forms as it swings through its narrow limestone gorges near Symonds Yat and enters the Old Red Country near Monmouth where the valley opens out and the landscape is gently undulating. In these wider reaches the river traverses its alluvial flats, rich meadow land where well-fed cattle graze. Between Llandogo and Tintern, just south of this area, the valley narrows to a limestone gorge.

It will perhaps be well to mention here the difference in the Old Red Rocks traversed by the Wye and its tributaries, as no differentiation is shown on the geology map and their effect on the behavior of the rivers is considerable. The deposits consist of: (1) the Lower Division of corn-

FIGURE 1.—It will be seen from this map that the area studied is located in western Monmouthshire and adjoins the South Wales Coalfield.

stones, marls and brownstones overlaid by (2) the Upper Division of quartzose, conglomerates and sandstones.

The character of the Wye Valley changes completely as it makes its way through the strata of the Upper and Lower Divisions of the Old Red Rocks. The combination of gorge and meadow can be explained in this light. Above Kerne Bridge, crossing the Plain of Hereford, the river winds over the fertile marls of the Lower Division and the valley widens into rich pasture. At Bishops Wood Hill the characteristic gorge features appear again as the river passes round the harder conglomerate and sandstone hills and on to its limestone gorge. Above Monmouth the valley narrows through the masses of conglomerate, but approaching the town where the river is joined by the Trothy and Monnow the hills recede.

One characteristic feature of the Old Red formation may be noted here; where the conglomerates of the Upper Division crop out in the valleys, weathering breaks them up and huge blocks become detached from the main mass. The famous Buckstone on Staunton Meend is a large block of this sort, 60 feet in circumference. Staunton Meend, nearly 900 feet high, is capped with conglomerate, and the Buckstone has been detached through the disintegration of marls below the conglomerate. It was a rocking stone, but was removed by the proverbial American tourist, and since it has been replaced it no longer rocks. It is possible to walk round Staunton Meend on a fine outcrop of Old Red Conglomerate where there are many other massive blocks resembling the Buckstone, but not so large. Away to the southeast on the other side of the Wye in the upper valley of the Olway Brook, one can walk along the 600 feet contour line for three or four miles on an outcrop of the conglomerate marked by great detached masses of "pudding stone," as it is locally called. The pine trees come close to the edge of the outcrop, and in between the grey rocks the heather and gorse grow thickly, while below lies the fertile valley with its red-ploughed fields, pasture lands, and picturesque scattered farmhouses.

FIGURE 2.—The Buckstone, a detached mass of conglomerate, is over sixty feet in circumference.

FIGURE 3.—The Parkhouse Rocks, detached masses of conglomerate or "pudding stone," forms a sill between Trellech and Llanishen.

Between Trellech and Llanishen the most striking part of this sill of conglomerate is known as the Parkhouse Rocks (Fig. 3).

THE OLD RED SANDSTONE—WHAT IT MEANS

Coxe, the historian, quotes (1799) the Red Land of Gwent as the old name for Eastern Monmouthshire. Caerwent with its fine Roman remains and Wentwood with its Roman pavement also remind us that this was the Venta Silurum of Julius Caesar. The name Red Land of Gwent is interesting as a proof of the impression made by the prevalence of iron oxide in the soil and the water, the strong coloring being obvious to the most casual observer. Incidently it may be pointed out that the old name is preferable to the later geological term Old Red Sandstone; the latter is not an accurate title for this formation, only about one-third of it being sandstone while the rest is marl, conglomerate, and cornstones, as stated above.

Before attempting to map the distribution of soils and crops it may be well to give a short description of the most important Old Red soils (see Fig. 6), classifying them according as they are derived from (1) the Upper Division of conglomerate and sandstone, or (2) the Lower Division of (a) cornstones and sandstone, and (b) marl and sandstone.

The conglomerate and sandstone of the Upper Division weathers into a poor hungry soil of a gravelly nature. The material is hard and often gives rise to hilly ground. It caps the Black Mountains and Brecknock Beacons, and the Kymin near Monmouth. "The Ryelands" on the Old Red Sandstone north of the

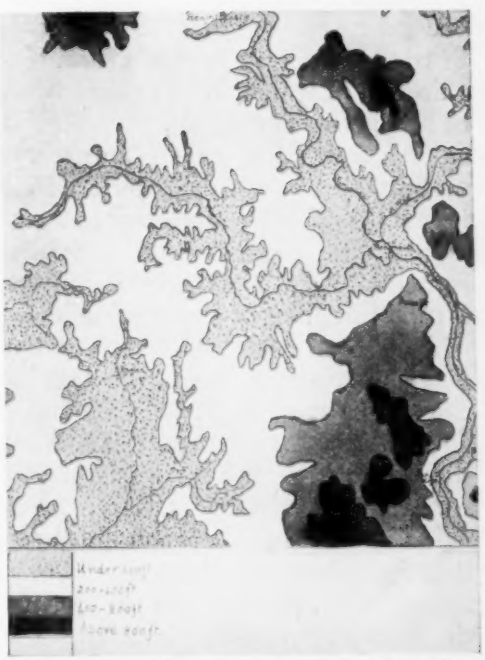


FIGURE 4.—Map showing relief. The River Wye and its tributaries drain the east of the region, and the Olway Brook the southwestern part.

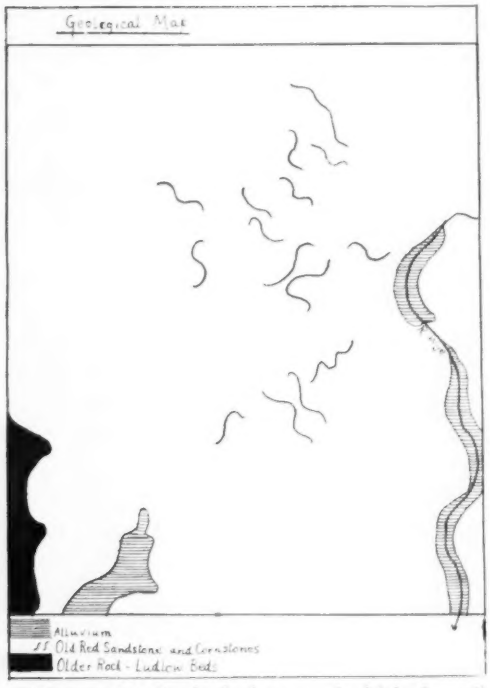


FIGURE 5.—Geological map, of which the soil map (Figure 6) is an analysis.

Forest of Dean, so-called because of the poor sandy soil which was only fit to grow rye, is a typical example of this soil, in which the Ryeland breed of sheep was developed.

The formation called cornstones and sandstones of the Lower Division is found typically developed in Monmouthshire and Herefordshire and forms soil of an excellent quality. It is full of nodules of impure limestone, which, when weathered and broken down, supply a large amount of calcareous matter (itself a manure) and acts on the other portions of the soil to set free the fertility therein. As a matter of fact, it is the great value of this soil for arable purposes that has given the name of "Cornstone" to it, because the presence of the limestone nodules causes the land to be of a gravelly, friable nature while it is excellent for growing all kinds of corn. The alluvium derived from this formation is, of course, of even greater fertility. Many valleys or districts which go under the name of "Golden Vales" in their respective localities, such as the Golden Vale of Tipperary, are situated on this formation.

The oak is the tree specially characteristic of this soil, but it grows too quickly to produce sound timber. This formation is famous for orchards and hop gardens. On no other soil except the Old Red Marl does the apple flourish so well, *e.g.* on the Carse of Gowrie and in Hereford, Monmouthshire, and Devon.

The Marl and Sandstone of the Lower Division is, taken all round, the richest and best soil of the British Isles. It is reddish in color, though sometimes when the marl is dug up from a depth where it has not been affected by the atmosphere it may be slightly green in color. It produces what might be called a strong loamy soil. It is good in quality for all sorts of crops and practically in all sorts of climates. It is excellent soil for

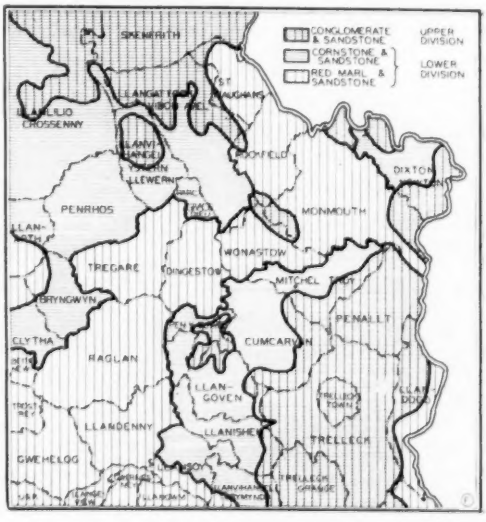


FIGURE 6.—In this soil map, note the three main types of soils which constitute the Old Red Sandstone of Figure 5.

"roots," *e.g.* Dunbar red potatoes and wheat, and is better adapted for fruit trees than any other.

Comparing the soil map with the relief map it will be seen that the conglomerate and sandstone cap the highlands of the district (a) in the parishes of Trelleck, Llandogo, Penallt and part of Cwmcarvan west of the Wye and Dixton Newton on the east bank of that river and (b) on the hills east and west of the Monnow Valley in the parishes of Skenfrith, Llantilo, Crossenny, Llanvihangel, Ystern, Llewern, while the parish of Pen-y-Clawdd is an isolated hilly mass of conglomerate.

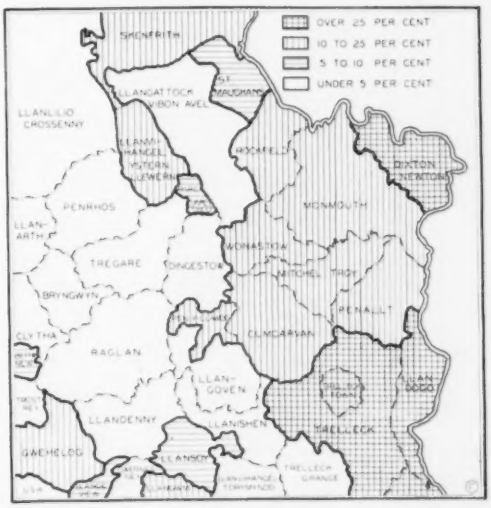


FIGURE 7.—Map showing acreage of woodland. Most of the woodland is found on the poor conglomerate and sandstone of the Upper Division of the Old Red Sandstone.

The maps showing acreage of woodlands (Fig. 7) and the number of sheep to the acre (Fig. 8) bear out the fact that these districts have a poor sandy soil. Trelleck, Llandogo, and Dixton have a high percentage of woodland, largely under the management of the Crown. Coniferous trees predominate; the Scotch Pine, Douglas Fir, and larch flourish even on exposed heights, as the rainfall is heavy (average over 50 inches per annum). The oak has always been important in this part of Monmouthshire and grows in less exposed positions than the coniferous trees. In the first half of the nineteenth century the extraordinary high price of oak bark for tanning purposes occasioned the cutting down of immense quantities of oak trees of a premature age for the sake of the bark, which found a ready sale in situations near to water carriage. Hassall, in his "Agricultural Survey of Monmouthshire" (1811) says: "The only profit now made of many coppices is by cutting them down as often as the wood is of a size fit for making charcoal which is consumed at the iron works in the east of the country, where the iron is smelted by charcoal. The price of cordwood is entirely regulated by the iron masters who consume it. Elm trees thrive in more sheltered positions, and at one time there were many walnut trees, but they have been recklessly cut down, the wood being sent to the gun makers at Birmingham. Very few now remain. Whimberry bushes grow thickly on the moor and woodland, and in June and July women and children flock to the meends, where they pick the berries from sunrise to sunset. Motors collect the fruit and take it away for making dyes at the chemical works on the Usk above Newport.

Sheep are largely reared on these conglomerate and sandstone heights wherever the woodlands give place to grass, notably in the parishes of Llantilio, Penrhos, Tregare, and Rockfield (see Fig. 8), where the sandstone soil is less coarse than on the hills west of the Wye and is covered with short crisp grass on which the small hardy breeds of

FIGURE 8.—One may conclude from this map showing number of sheep per acre that most sheep are reared on the Conglomerate, Cornstone, and Sandstone, and not on the richer marls.

Welsh sheep are reared and form excellent mutton.

A small percentage of the land on the heights is covered with a stony pale yellow clay soil which gives rise to wet and boggy moors, *e.g.* a stretch of moorland near Trelleck called Broad Meend. This is a peat bog which has been "skinned," and the turf is no longer cut.

The formation called cornstones and sandstones of the Old Red Rocks extends through a number of parishes in the upper valleys of the Monnow and Trothy and in the undulating land between the river valleys. The parish of Penrhos is overlaid by this formation and large areas in the parishes of Llantilio, Llanarth, Bryngwyn, Pen-y-Clawdd, Llanvihangel, Llangattock, and St. Maughans. The soil here is very fertile, but the relief map shows that much of this land is over 600 feet high, giving a lower mean temperature than in the valleys, while the rainfall is also heavy (54.5 inches average annual rainfall). Oats flourish in a cooler, moister climate than wheat, hence we find oats more important on this soil than either wheat or cattle pasture. Pen-y-Clawdd is an exception, as more than half this parish is conglomerate; thus the farmers are largely engaged in sheep rearing. Some cattle are reared in the sheltered valleys of Llanvihangel and Bryngwyn; but speaking generally, the cornstone and sandstone district here has a climate which makes it most suitable for oats and sheep pasture in spite of its great natural fertility.

In the parishes drained by the Lower Monnow and Trothy to the Wye and by the Olway Brook and its headstreams southwest to the Usk, weathering and erosion by the streams has exposed the lowest formation of the Old Red Sandstone, viz., the marls and sandstone of the Lower Division (see Figures 6 and 12). Here the soil is extremely fertile and ideal for wheat cultivation and rich pasture land. By consulting the soil map and the maps showing acreage of crops and pasture, it will be seen that the parishes overlaid by this formation have the largest percentage of wheat land and cattle pasture. In the rich marl region drained to the Wye by the Monnow and Trothy, Monmouth and Rockfield parishes have the largest acreage of wheat, while the vale lands drained by these rivers are rich meadows, especially where they lie low enough to receive the floods of those rivers whose waters bring down the rich mucilaginous mud of Hereford. The farmer here devotes himself to raising stock for the market, and finds nothing better than the long-horned Hereford breed. Tregare, Dingestow and Wonastow are largely taken up with these rich grazing lands. Many

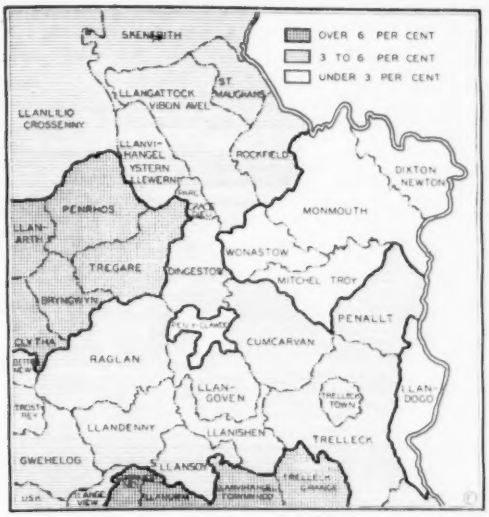


FIGURE 9.—The acreage of oats is most important on the Cornstone and Sandstone of the Lower Division.

of the farms consist of low and high lands and have the convenience of maintaining their cattle upon the higher, drier sandy soils during periods of continuous rainfall. The parishes of Tregare, Raglan, Llandenny, and Llangeview are drained southwest by the Olway Brook and here again the red marly soil is chiefly under wheat and cattle pasture. In the parish of Raglan, largely composed of sheltered vale lands, the number of cattle reared is not as large as on other parishes of this formation, but apple orchards and hop gardens employ the farmer as well as the cultivation of wheat.

From what has been said, it will be seen that woodlands and sheep pasture are associated with the sand and conglomerates of the Upper Division; oats, sheep and a few cattle with the cornstones and sandstones; while the rich cattle pasture and the highest percentage of wheat to the acre (though comparatively small compared with the eastern counties of England) are found on the marl and sandstones of the Lower Division. From Figure 10 showing acreage under wheat, it can be seen that in spite of the suitable soil, a very small percentage of the land is under this crop. The heavy rainfall accounts for this to some extent, and the fact that August is often one of the wettest months makes the harvest very doubtful.[1]

The conversion of arable land into pasture which has been taking place everywhere in the British Isles is nowhere more marked than in the Red Land of Gwent. Roughly speaking, before the war, one-half of the country was grass and of the other half, one-third was arable, one-third woodland, and one-third heath. During the war, the percentage of arable land was nearly doubled; much of this is gradually becoming pasture

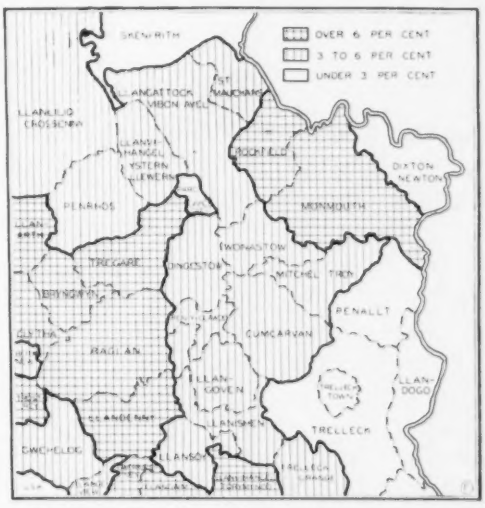


FIGURE 10.—That the greatest acreage of wheat is grown on the richer soils of the Lower Division is plainly shown in the above map.

again, but pre-war figures for acres under pasture have not yet been reached. It is obvious that much less labor is needed on pasture land

[1] Average rainfall for August, 4.6 inches. Figure supplied by the Director of Agriculture.

than on arable land, and the fact that so low a percentage of the total acreage of the Red Land of Gwent is under the plough is an important factor in the composition of the population. Further, many of the farms are quite small holdings. A farm of 300 acres is rarely found, while very few comprise 200 acres: the typical holding is from 20 to 30 acres. Such a farm can, and indeed must, be

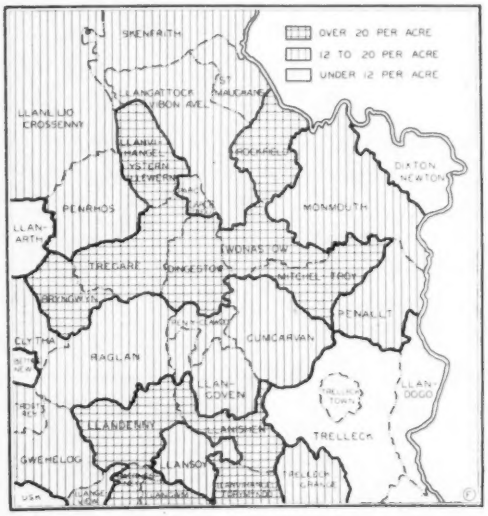


FIGURE 11.—Number of cattle per acre. Most cattle are reared on the marls of the Lower Division in the river valleys.

worked by the farmer and his family if the undertaking is to be at all profitable. In fact the average number of laborers employed on a farm is only two, so that farmers and woodmen form the bulk of the population.

DISTRIBUTION OF POPULATION

It is natural that in a region on the Welsh border numerous examples of isolated farmsteads and tiny hamlets should exist. Although so insignificant on the population map, they are important as survivors of the old tribal system of the Celts. The population map shows clearly a diagonal trend. The relief map superimposed on the population map makes it clear that settlement roughly follows the river valleys, whereas the uplands between these valleys are practically devoid of habitation. This is markedly true of the valleys of the Monnow and the Trophy, these rivers having cut their courses down through the sandstone and conglomerate to the fertile red marl.

In this part of Monmouthshire the origin of a village is sometimes found in the old tribal homestead. While examples of this type of farm still survive, more usually the expansion of the tribal family led to a certain degree of separation and resulted in a village formed by the clustered dwellings of the different families no longer living under one roof. Many of the villages of this type, such as Rockfield, Llanrothal, make the best of their elevated situation by squeezing in a hollow in the hillside.

Many more have grown up round castles built on eminences which commanded views of the important routes of the surrounding country; Raglan, Dingestow, Goodrich, and Tre-castle are villages that have originated in this way. The great number of castles in Eastern Monmouthshire must be attributed to its position as a borderland between the English and the Welsh. A regular chain of fortresses seems to have been built by the Normans on the banks of the Monnow, Wye, and Severn; among these were Skenfrith, Grosmont, Monmouth, Chepstow, and Caldicot. In addition to these strong fortresses several smaller castles, or rather castellated mansions, were constructed for the purpose of keeping the natives in awe. These are scattered in various parts of the country, *e.g.* Raglan, which at

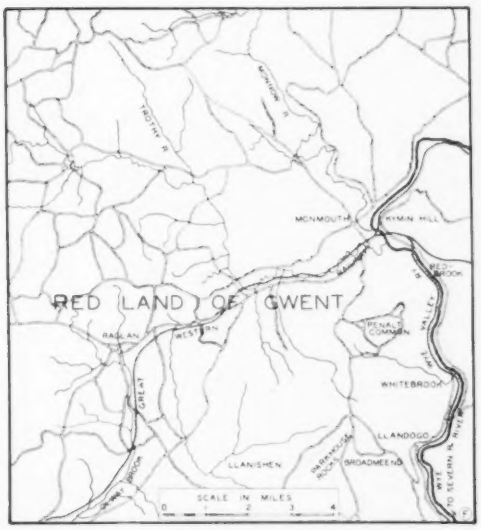


FIGURE 12.—Map showing rivers and communications. Waterways, roads, and railways converge on the town of Monmouth.

first was only an agrarian fortress. We know that Raglan Castle demesnes extended to Llantilio Crossenny in Charles I's reign and included deep parks and extensive oak and beech forests. "Skenfrith Castle, in a recluse spot surrounded by hills, was built as a garrison for defence of an important defile through which the River Monnow flows" (Coxes Tours).

Other villages owe their origin to natural resources of a local character. Trellech, for instance, has chalybeate wells. Coxe, in his "Historical Tours," quotes writers of a very early date who speak of "the remedial qualities of the waters of this 'Virtuous Well' which was visited by the sick and ailing." At Redbrook on the Wye, iron was mined at an early date. Smelting was, of course, by charcoal, an abundant supply of which was available in the neighboring forest. The village, in fact, owes its name to the iron oxide which colors the stream entering the Wye at this point—hence Redbrook. At Whitebrook, 2½ miles below Redbrook, paper mills were worked by power from a short, swift stream entering the Wye. The wood for pulp, for these now derelict mills, was drawn from the adjoining pine woods.

Llandogo is another instance of a village owing its existence to water power. These villages were dependent on the Wye for transport and thus shared the considerable river traffic between Monmouth and Bristol. Goods were taken down the Wye as far as Brockweir in barges built to draw only 5 or 6 inches, on account of the shoals. At Brockweir the goods were transferred to larger barges called "trows," which did the rest of the journey. There was naturally a tendency for villages to develop near weirs because of the working of the locks erected to avert the fall of water. Brockweir, Coed, Ithel, Bigsweir and New Weir (old name for Symonds Yat) grew up at such points. The old locks fell into disuse in 1873 with the decline in river transit, when the Wye Valley Railway was opened.

The town of Monmouth dominates this area west of the Wye. It is an interesting case of nodality and, as the communication map shows, is the meeting place of four important routes. Situated at the head of two defiles, it has been a strategic point from Roman times, when it was called Blestium; it was also one of the strongholds used by the Saxons to maintain their conquest between the Severn and the Wye and to prevent the incursions of the Welsh. Its importance is largely due to its having been a bridge town from very early times, there having been one bridge over the river at this point ever since Blestium was occu-

pied by the Romans. Both the Monnow and the Trothy are bridged here, these bridges dating from the Norman Period. Now the Wye is spanned by three bridges at this point, two having been constructed to carry railways. A castle which existed when the Doomesday Book was compiled fell later into the hands of John of Gaunt and was the birthplace of Henry V. Coxe states in 1801 that the inhabitants of Monmouth are principally supported by the navigation of the Wye, there being no important industries. He refers to the bark being taken down the river to Chepstow, where it was cleaned and exported; he also makes mention of the "dead industry" of cap making.

The real importance of Monmouth today lies in the fact that it is the only market centre in this district, and the farmers of the surrounding villages all take or send their produce to Monmouth. Dairy produce and poultry are the most important market products, cheese and butter being specially noted. Every Friday the roads converging on the little town from all directions are gay with the traditional market carts hurrying along, though now many travel from villages by motor lorries. Road transit is all important, as the railways of the Land of Gwent are few and far between, the agricultural villages being badly served. The only railway line is a branch of the Great Western which cuts across the map diagonally, utilizing the valleys of the Upper Usk and the Lower Trothy from Usk to Raglan and Monmouth and thence to Coleford. The Wye Valley line from Chepstow follows the river to Monmouth, and the Monmouth-Ross line connects it with the Great Western main line at Hereford.

The excellent roads make up for the lack of railways in the Old Red Country. Today the Monmouthshire roads are some of the finest in the Kingdom, far superior to those on the Gloucestershire side of the Wye. A county council road surveyor has offered a partial explanation of this fact. It seems that on the roads from Bigsweir to Monmouth on the Gloucestershire side of the Wye the stone used for metalling is the hard Dhu stone quarried in the Clee Hills, but this is often too hard for the subsoil, so some of the roads here are poor. On the Monmouthshire side of the Wye, limestone from the Wynd Cliff quarries is used, and on the hard subsoil of the Old Red Sandstone it makes excellent roads. A comparison of the relief and road maps shows some very steep "pitches" on these roads west of the Wye, one of the best known being Star Pitch, south of Llanishen, where the road drops 400 feet in less than half a mile, retaining its excellence in spite of the difficulties of draining.

FUTURE POSSIBILITIES OF THE DISTRICT—THE RED LAND OF GWENT

After an investigation of the structure and economic development of an area, the geographer naturally asks, "What of the Future?" Thus in 1811 Charles Hassall concluded his Agricultural Survey of the County of Monmouth with this forecast: "The increased demand for human food of every kind in the mining district of this county calls for the exertions of its agricultural resources and holds out such encouragement to the landowners and occupiers of the land as will, it may fairly be presumed, at no distant period, place

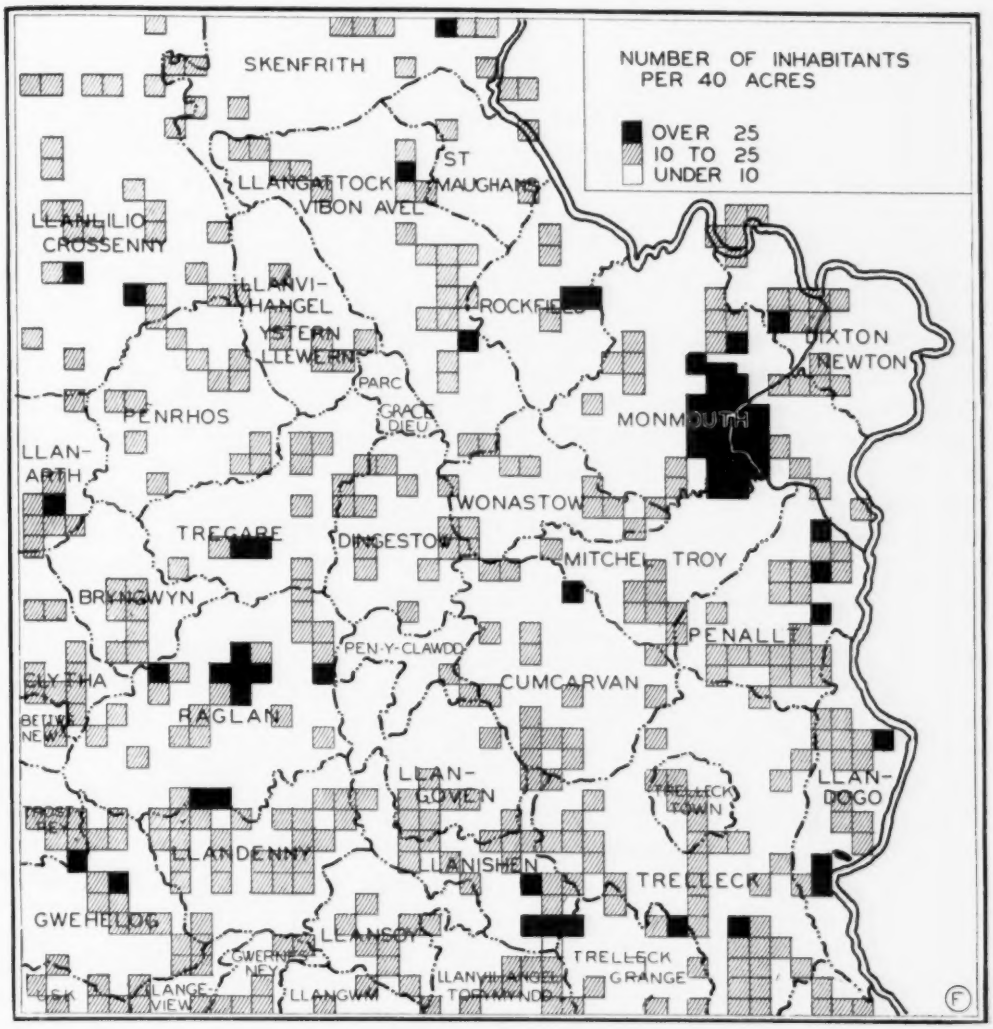


FIGURE 13.—By comparing the population map with the relief map, Figure 4, and the soil map, Figure 6, it will be seen that the densest population is in the river valleys where the fertile red marl is exposed.

this county among the first in Western Britain for excellence in that useful and necessary application of the faculties of rational men." Just over a century has elapsed, and decline is written over much of this district, but while agricultural productivity is poor, it would appear that organization of capital and transport can bring prosperity to the area.

If one seeks the causes which have prevented the Red Land of Gwent, with its tracts of fertile soil, from attaining the high development anticipated by Hassall, three factors emerge: (1) the heavy rainfall; (2) the difficulties of communication, including the absence of railway facilities; and (3) the lack of capital among the farmers. Today the dense populations of South Wales depend largely upon Ireland for supplies of bacon, butter, eggs, poultry and some fresh meat. Even the milk supply from the neighboring

counties is inadequate, and much condensed milk is necessarily used. Without any rash attempt at a forecast of conditions after the flight of yet another century, it is interesting to show how these difficulties, one of them physical, might be overcome.

It is true that a heavy rainfall is prejudicial to wheat, but there are other crops, notably oats, which could be grown to advantage for the market. The uneconomic custom for each farmer to grow sufficient oats for his own needs (and already the acreage put under oats for forage required by the War Office is reverting to poor pasture only suitable for sheep) is a great handicap. With good oats and the rich pasture lands, agriculture so far as the soil is concerned might be highly productive.

The other obstacles to prosperity are of a different nature. One of these, viz., transport, is a problem of distribution of supplies and produce which can be solved here as has been done in other areas. Motor transit, by enabling farmers to send their produce to the towns of the coalfields in greater quantities and with less delay, gave a powerful impetus to dairy farming during the Great War. Motor lorries now call daily at some of the large farms to collect the milk, and much more might be done in this way if the service were extended. But for the small farmers, many collecting depots are required to which they can bring their milk ready for the vans carrying supplies to the industrial areas. Nor does the benefit of improved transport end there. Return freights, urgently needed by the farmers, would be available in the form of coal for domestic purposes and basic slag for fertilizing. These supplies would be brought from the mines and steel works. The basic slag, so obtained, is an excellent fertilizer for the sandy and conglomerate soils of the area. With the increased production of potatoes, the rearing of pigs would become a more profitable industry. There is a local breed known as the "Gloucester Spot" which is reared to some extent here.

But this development, beginning with the creation of a transport system, can only come to pass if capital be forthcoming. The farmers of the area are becoming poorer, not richer, so that they will hardly be able to supply the necessary capital. Assuming that the time will come when greater productivity in this area will be much needed, there appear to be two possible lines of development: (1) capitalists, seeing in the establishment of a transport system with its various ramifications a profitable field for their capital, will forthwith begin to tap the resources of the district; or (2) by a coöperative scheme of credit banks the farmers themselves will be enabled to develop their own area. Under the first system the tendency would be for the whole activity of the area to pass under the direction of one or more capitalistic undertakings. The movement might begin thus—a transport company would run motor vans and establish depots; in order then to secure certain and punctual supplies, it would probably buy land as it came into the market and so gain direct control of certain farms. The usual collapse of the small farm, unable to produce on the same terms as the better organized large scale business, would inevitably follow, while the few larger farmers would prosper and tend to form part of the controlling company.

Because of the difficulty and ex-

pense of procuring fertilizers the soil is often kept in a state of poverty, much resembling the old system of tillage by which large tracts of land are cultivated and exhausted and then left fallow for several years, until they become sufficiently recovered for a repetition of the same bad husbandry. This state of affairs is not due in any large extent to want of industry on the part of the farmers; for many examples can be quoted showing the way in which some of them, on the poor conglomerate areas in the parishes of Trelleck and Penallt, have reclaimed and worked the poorest stony heathlands, converting them into fields for root crops by digging out the huge stones which are used for building outhouses and enclosing the fields so reclaimed.

It would seem that by a system of coöperative banks, much might be done to strengthen their position. Ireland and Germany show what can be achieved along these lines and, given facilities for the purchase of modern agricultural implements, and for the supply of good fertilizers and well-selected seed, the farmers themselves could retain their ancient heritage and raise their production to the utmost capacity of their land.

The Agricultural Organization Society, working in close connection with the Ministry of Agriculture and Fisheries, has begun the organization of the district in the direction of Coöperative Production, and much may be expected from the recently founded Monmouth Agricultural Society Limited. (See A. O. S. Annual Report.)

AGRICULTURAL REGIONS OF NORTH AMERICA

Part V—The Hay and Dairying Belt

Oliver E. Baker

Agricultural Economist, U. S. Department of Agriculture

THE Hay and Dairying Belt includes those portions of the cool, humid, northeastern part of the United States and adjacent part of Canada in which agriculture is more important than the forest industries, and hay and pasture have a greater value than corn for grain and wheat (except in districts of southern Michigan). Dairying is the dominant agricultural industry in most of the Belt (Fig. 131). The region, which extends from the eastern edge of the Red River Valley in Minnesota to Cape Breton Island in Nova Scotia, is about 1,800 miles long; and from the Corn Belt and Corn and Winter Wheat Belt on the south to the forests of extreme northern Minnesota, Wisconsin, and Michigan, northern Ontario and Quebec, which bound the region on the north, the distance varies from 200 to 400 miles (Fig. 132). In eastern Maine, the Maritime Provinces and eastern Quebec, however, the Belt dwindles practically to a strip of land along the coast and up the St. Johns and St. Lawrence Rivers. The portion in the United States contains an area of about 180,000,000 acres, which is nearly one-tenth of the land area of the nation. About one-fourth of the population of the United States, however, resides in this Belt. The part lying in Canada has an area of less than 50,000,000 acres, which is only 2 per cent of the area of Canada. But this Belt includes most of the arable land of eastern Canada, and 70 per cent of the population of the Dominion (Fig. 133).

The total area of the region is, therefore, about 230,000,000 acres. The Belt is only three-fourths as large as the Cotton Belt, but a half larger than the Corn Belt. The population of the region is about 36,000,000, which is much greater than that in any other agricultural region. However, less than 7,000,000 of these 36,000,000 people live on farms. The number of farms in the region is about 1,450,000, of which 1,075,000 are in the United States, and 375,000 in Canada. One-sixth of the farms of the United States are in this Belt, and over half of the farms in Canada. The average number of people per farm in the United States portion of the Belt is 4.5.

The region produced crops in 1919 (Canada, 1920) having a farm value of nearly $2,900,000,000, which is 75 per cent as great as the value of the crops of the Cotton Belt, and 90 per cent as great as those of the Corn Belt.[1] As this region contributes also half the dairy products produced in North America, it appears probable that the value of the agricultural products is about equal to that of the Corn Belt, or of the Cotton Belt. However, the average value of the crops per farm, although greater than

[1] Economic Geography, July and October, 1927, issues, "Agricultural Regions of North America," Parts III and IV, by the author.

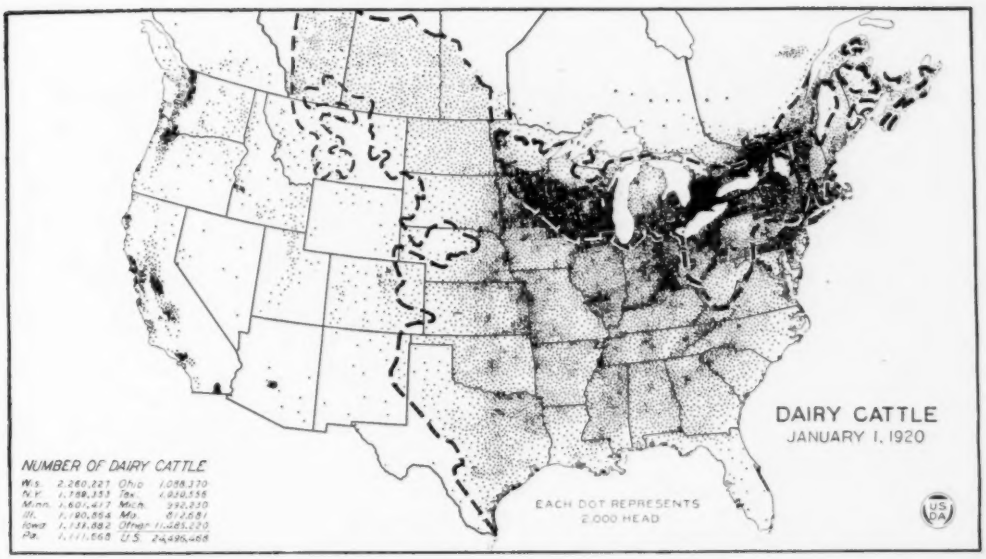


FIGURE 131.—Nearly half the dairy cattle in North America are in the Hay and Dairying Belt, roughly outlined on the map; while nine-tenths are in the humid and sub-humid regions lying east of the dashed north-south line on the map. In the Hay and Dairying Belt, hay and pasture for the cows are abundant, and corn also is generally grown, both for grain and silage. Dairying, moreover, provides work during the long winters, and the cool climate promotes a high quality of milk. Another important factor is the location, within or adjacent to this Hay and Dairying region, of over half the urban population of North America, who need fresh milk daily. (Map copyrighted by O. E. Baker, 1926.)

in the Cotton Belt, is only a little over half that in the Corn Belt.

In practically every county in this region, hay and pasture occupy over one-half of the arable land (Fig. 134). The hay is grown mainly to feed the cows during the winter, and occupies as great an acreage as all the other crops combined; while the pastures, which are even more extensive than the hay lands, afford excellent feed for the summer. More or less corn is grown for silage in almost all portions of the region, and is becoming increasingly important, because of the large amount of feed per acre which it provides (Fig. 135). Oats are an important crop throughout the region, but the production in the western portion is much heavier (see Fig. 118).[2] The oats are grown mostly to provide feed for horses. Along the southern margin of the region, wheat is an important crop, and the major portion of the corn crop along this warmer zone is harvested for grain (see Figs. 12, 14, and 15).[3]

Potatoes, vegetables and fruit are important crops in certain localities (Figs. 136, 137, and 138). Although these crops included only 8 per cent of the acreage, they constituted 25 per cent of the value of all crops in 1919. Both the climate and the nearby markets afforded by the many large cities in the region, or along its margin, have contributed to the development of the fruit and trucking industries. Rye also is an important crop locally in the areas of sandy soils (Fig. 139), while beans

[2] ECONOMIC GEOGRAPHY, October, 1927, issue, "Agricultural Regions of North America"; Part IV, by the author.

[3] ECONOMIC GEOGRAPHY, October, 1926, issue, "Agricultural Regions of North America", Part I, by the author.

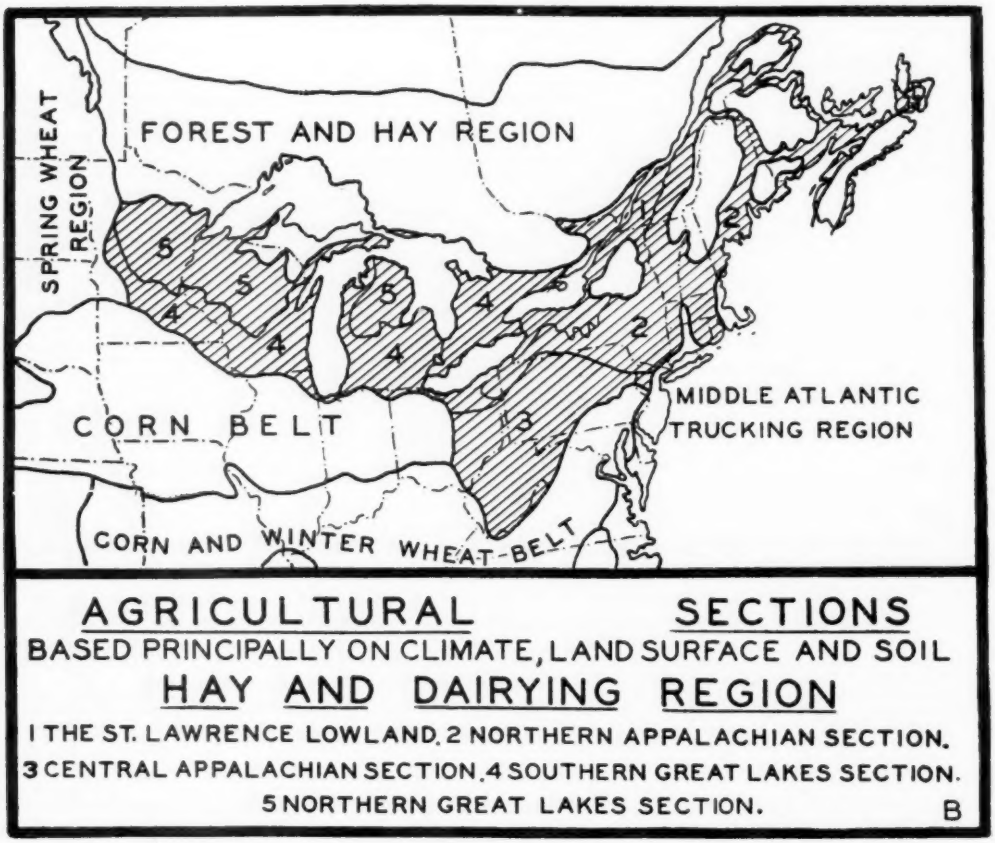


FIGURE 132.—The Hay and Dairying Belt, which is lightly shaded on this map, lies between the Corn Belt on the south and southwest, the Corn and Winter Wheat Belt and Middle Atlantic Trucking Belt on the southeast, the Atlantic Ocean on the east, the Hay and Forest Belt on the north, and the Spring Wheat Region on the west. Within the Hay and Dairying Belt there are wide differences in the use and productivity of the land owing primarily to physiographic and soil conditions. These physiographic and soil differences give rise to subregions which are too small to show on the map. But it is possible to divide the Belt into five large sections, characterized by a general similarity of agricultural conditions. The sections are indicated on the map, and each section is briefly described in the text.

are grown in western New York and central Michigan, where the climate is mild and the growing season long, and sugar beets are produced in Michigan and Wisconsin, where there is more sunshine than in the eastern portion of the Belt.

PHYSICAL CONDITIONS

The Hay and Dairying Belt is a region of great diversity of topography and soils, but the climatic conditions are so similar as to favor the production of the same major crops and kinds of live stock throughout the region.

Boundaries

The southern boundary of the Belt is drawn where hay and pasture cease to constitute over half of the arable land and corn or wheat becomes the dominant crop. This is approximately the line of 69 degrees mean summer temperature across Minnesota and northeastern Iowa, but rises to 70 degrees in extreme northern Illinois and Indiana and

FIGURE 133.—Agricultural land in eastern Canada is restricted practically to Ontario south and east of Georgian Bay and Pembroke, to the St. Lawrence Lowland of Quebec and to the valleys and ocean shores of the Maritime provinces and lower Quebec, with outliers in the St. Johns Lake Basin of Quebec and in the Clay Belt south of Hudson Bay. In most of this region dairying is the dominant agricultural enterprise, but it is especially well developed in southern Ontario, the St. Lawrence lowland and Prince Edward Island. Around the margins of the dairy districts and in the Clay Belt general farming, based on hay and the small grains, is important. In the Annapolis-Cornwallis Valley of Nova Scotia and along the shores of Lakes Ontario and Erie, also along the southern shore of Lake Huron, fruit production becomes the dominant industry in many localities. (Map supplied by Natural Resources Intelligence Service of Canada).

northwestern Ohio (Fig. 132). The boundary then turns southward across central Ohio, separating the mostly level and fertile Corn Belt lands to the west, where the glacial soils are derived largely from limestone, from the hilly, less fertile shale and sandstone lands to the east. In this hilly region of eastern Ohio and Central Pennsylvania, and on the uplands of West Virginia, hay and pasture are more important than corn and wheat. But eastward in the limestone valleys, on the Piedmont and on a part of the Coastal Plain of Virginia, Maryland and New Jersey, likewise in some of the limestone valleys and on the Piedmont of Pennsylvania, corn and winter wheat are the dominant crops, hence these districts have been assigned to the Corn and Winter Wheat Belt. The southeastern boundary of the Hay and Dairying Belt, therefore, follows along the Allegheny Front most of the way from southwestern Virginia to near New York City. Along this boundary the average summer temperature is about 71 degrees. In New England the warmer Connecticut Valley, with its lighter soils, and likewise sandy southeastern Massachusetts and the district around Boston, extending northward to Portland, Maine, are excluded because truck crops or tobacco are more important than hay and pasture.

The northern boundary of the region in Quebec and Ontario is the Laurentian escarpment that lies a few miles north of the St. Lawrence and Ottawa Rivers. Near Pem-

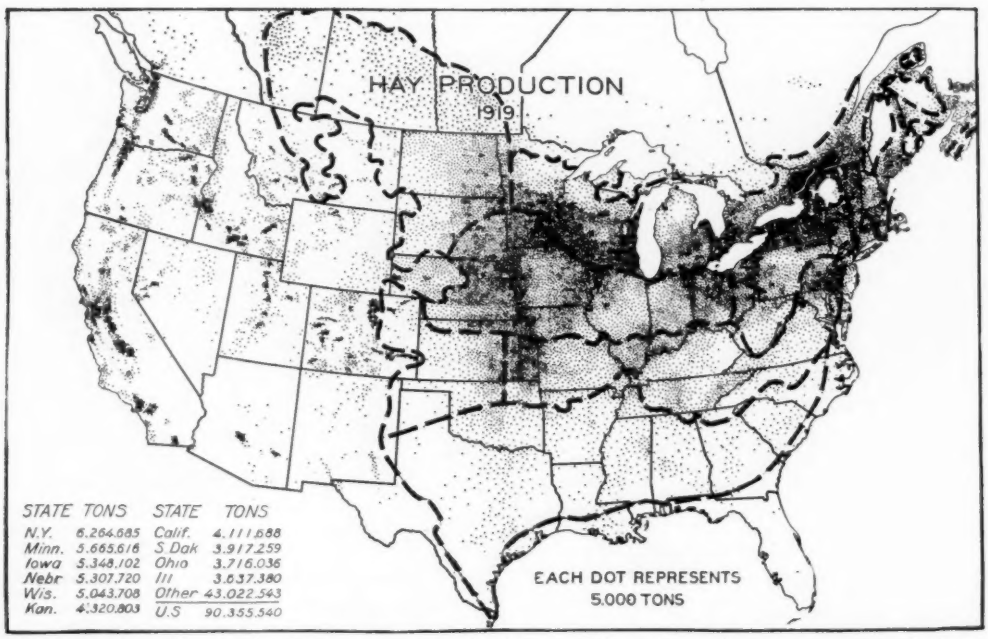


FIGURE 134.—Hay is the dominant crop in the Hay and Dairying Belt. It constitutes half the acreage of all crops, which is a larger proportion than cotton constitutes in the Cotton Belt or corn in the Corn Belt. The production is densest in the St. Lawrence lowland, western New York, eastern, southern, and western Wisconsin, and southeastern Minnesota; but the importance of hay is greater, relative to other crops, in the Maritime Provinces and New England, where it constitutes 75 to 85 per cent of the crop acreage, and in the Upper Great Lakes section. (Map copyrighted by O. E. Baker, 1926).

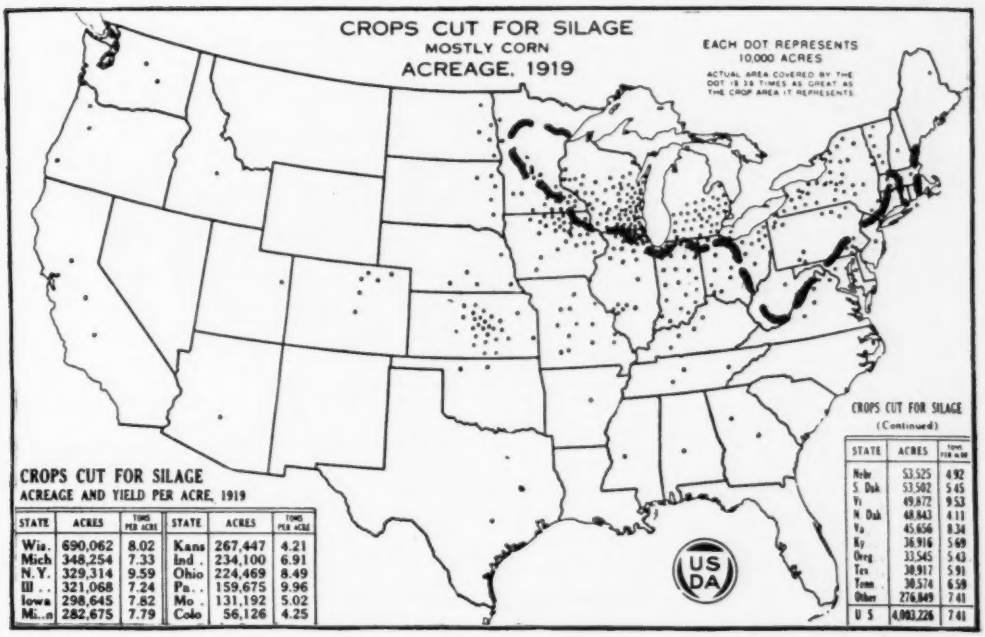
broke, in Ontario, this forested Laurentian region, with its hard metamorphic rocks sometimes swept bare of soil by the glacier, bends southward and includes much of North-central Ontario, then retreats westwardly along the northern shore of Georgian Bay and Lake Huron to the Soo. Much of the northern Peninsula of Michigan and the rougher portions of northern Wisconsin are excluded from the region because covered with forest, also the Iron Range region of Minnesota and the swampy country north of the Red Lake.

Along the northern boundary of this region the length of the frost-free season is about 110 days, and the mean summer temperature is about 63 degrees, which is the lowest summer temperature that permits the maturing of corn. Hay, oats, barley, and potatoes are grown in small quantities in the Clay Belt and Lake St. John Basin farther north, but outside these districts, owing to the shallow or sterile character of the soil, there are only a few farms beyond this northern boundary of the Hay and Dairying Belt (Fig. 133).

The forest or recreational industries are also more important than farming in much of Nova Scotia, in most of New Brunswick, northern Maine and the White Mountains, on the Green Mountain ridges and in the Adirondacks; hence, these areas are classified as outlines of the Forest and Hay Region to the north, rather than in the Hay and Dairying Belt.[4]

The western boundary of the Hay and Dairying Region is drawn at present along the eastern margin of

[4] See colored map of Agricultural Region, frontispiece to October, 1926, issue of ECONOMIC GEOGRAPHY.



CROPS CUT FOR SILAGE
ACREAGE AND YIELD PER ACRE, 1919

STATE	ACRES	TONS PER ACRE	STATE	ACRES	TONS PER ACRE
Wis.	690,062	8.02	Kans	267,447	4.21
Mich	348,254	7.33	Ind.	234,100	6.91
N. Y.	329,314	9.59	Ohio	224,469	8.49
Ill.	321,068	7.24	Pa.	159,675	9.96
Iowa	298,645	7.82	Mo.	131,192	5.02
Mi...n	282,675	7.79	Colo	56,126	4.25

CROPS CUT FOR SILAGE
(Continued)

STATE	ACRES	TONS PER ACRE
Nebr	53,525	4.92
S. Dak	53,502	5.45
Vt	49,872	9.53
N. Dak	48,843	4.11
Va	45,656	8.34
Ky	36,916	5.69
Oreg	33,545	5.43
Tex	30,917	5.91
Tenn	30,574	6.59
Other	276,849	7.41
U. S	4,003,226	7.41

FIGURE 135.—Nearly all the silage in the Hay and Dairying Belt is made from corn. The silage is fed principally to dairy cows in the winter. It will be noted that a much denser acreage is cut for silage in Wisconsin, northern Illinois, northeastern Iowa, and southeastern Minnesota than in New York and New England. The summers are warmer in this western portion of the Hay and Dairying Belt than in the eastern, and the soil is more fertile, hence much more corn is grown. (See Figure 109, October, 1927, issue of ECONOMIC GEOGRAPHY.)

the Red River Valley in Minnesota. Here the climate changes from humid to sub-humid, as indicated by the beginnings of a layer of lime accumulation in the sub-soil; the forest vegetation merges into a narrow band of aspen, and this quickly gives way to tall prairie grasses; and hay and pasture concurrently become less important than spring wheat. Along this western boundary of the region the average annual precipitation is 22 inches at the north and 26 inches at the south.

Climate

The average annual precipitation in this region ranges from 22 inches in northern Minnesota to 50 inches on the southwestern slopes of the Adirondack and White Mountains, but in most of the eastern portion the annual precipitation is between 35 and 45 inches, and in most of the western portion between 25 and 35 inches. The lighter rainfall in the western portion is fully balanced by the fact that 60 to 80 per cent is received during the warm season, April to September. During these months the rainfall is as heavy in Minnesota and Wisconsin as it is in New York and New England. In the eastern portion of the region the rainfall is almost equally distributed among the twelve months. The eastern portion, therefore, receives much more snow in winter than the western, the largest average amount, 150 inches, being reached in the Adirondacks. In most of the Belt, however, the annual snowfall ranges from 40 to 80 inches. Snow lies on the ground for 60 days along the southern margin of the Belt, and for 120 days or more along the northern margin.

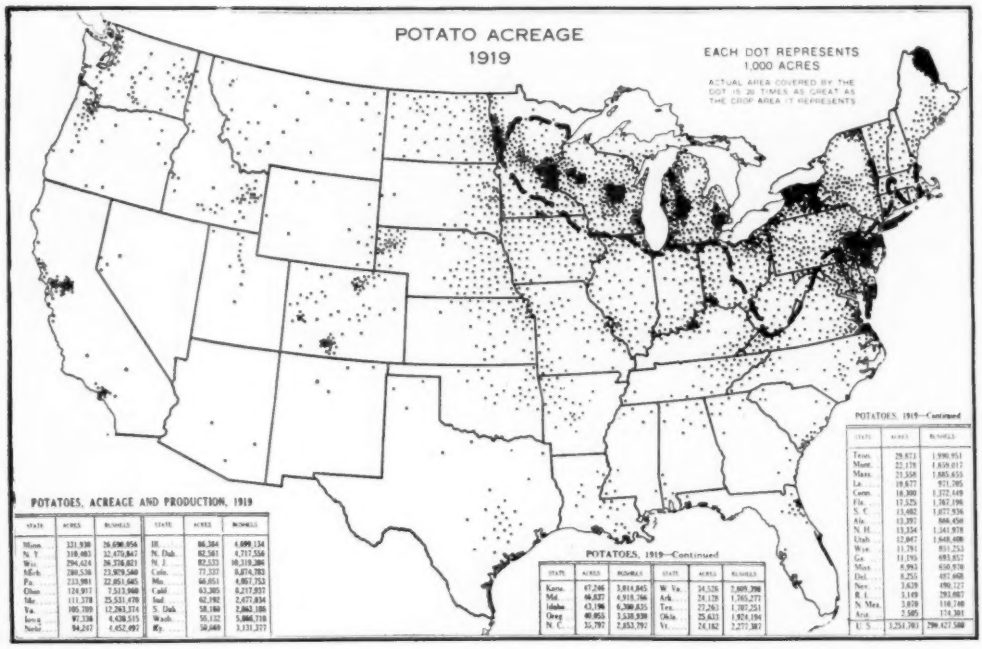


FIGURE 136.—Over half the potatoes produced in North America are grown in the Hay and Dairying Belt. This is owing partly to the fact that the quality and yield of potatoes are better in regions of cool climate, and partly to the fact that corn, which requires labor at the same time of year, is very productive and gives a greater return, tends to exclude commercial production of potatoes from the regions to the south. Only in the Middle Atlantic Trucking Belt, a region that raises early potatoes, is the production density comparable with that in the potato districts of the Hay and Dairying Belt. Many of the large centers of potato production are located near large cities, since potatoes are a bulky crop, expensive to transport, and can often be sold by local gardeners and farmers in competition with the crop from the large production centers. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

However, as moisture in this region is everywhere sufficient for the production of the staple crops, the principal climatic conditions to be considered are those of temperature. The influences of the Great Lakes and the ocean in the northern portion, and of altitude and air drainage in the central Appalachian extension, tend, in the eastern and central portion of the Belt, to retard the advance of spring until danger from frost is past, moderate the heat of summer, prevent, in large part, the occurrence of early frost in fall and of extreme temperatures in winter, and thus afford favorable conditions for the production of fruit. However, the lake influences are felt mostly along the eastern shores, owing to the prevailing westerly winds, and the ocean influences, for the same reason diminish rapidly inland. Along the northern margin of the Belt, where the average frost-free season is about 110 days, only hay, potatoes, the small grains and vegetables are extensively grown. Along the southern margin of the Belt, where the frost-free season exceeds 150 days, corn, in general, becomes more important than hay.

The cool summer temperatures, 63 to 70 degrees, the moderately moist climate, with a resultant forest vegetation, as well as the hilly character of much of the region, and the presence of many glacial lakes, have led to the development of summer resorts throughout the region. In parts of New England and New York and in the adjacent

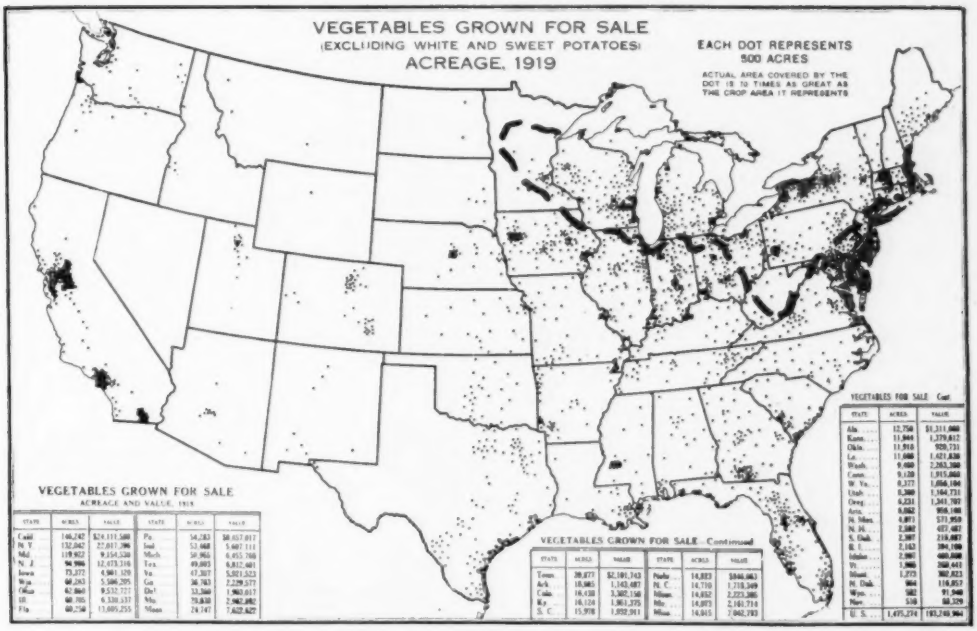


FIGURE 137.—The commercial crop of vegetables is very important in southern New England, western New York, southern and western Michigan and eastern Wisconsin. Smaller centers adjoin the larger cities. Only in western New York, however, is the trucking industry comparable in importance with that of the Middle Atlantic Trucking Belt. The importance of vegetable production in the Hay and Dairying Belt is owing not only to favorable climatic and soil conditions, but, perhaps even more, to the great centers of population located in the region or along its margin. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

portions of New Brunswick and Quebec, also in the Upper Lakes Country and around many of the little lakes in Michigan, Wisconsin and Minnesota, the recreation industry is probably of greater importance than agriculture.

Topography

The eastern Appalachian portion of this Hay and Dairying region is characterized by mountain ridges, rolling hill-lands and some fairly level plateaus, into which the streams have cut long and often narrow valleys. The St. Lawrence Valley, however, is so large as to constitute an exception to this statement, being 75 miles wide at Montreal and 500 miles long (Fig. 133). The crop and pasture land is located mostly in the valleys and on the plateaus, while the hilly lands are largely in forest. In the northern glaciated section there is less land too rough for crops than in the southern unglaciated section. The western Great Lakes states and Ontario portion of the region, including the lowlands of western New York, contains very little land too hilly or rough for agricultural use. The land surface in these lowlands is level to gently rolling. In the unglaciated section of southwestern Wisconsin and northeastern Iowa, however, especially along the Mississippi River, there is much "bluff" land, too rough for crop production.

Soils

In these Great Lake states, notably in east central Minnesota, in central Wisconsin, and in the northwestern portion of lower Michigan, also along

some of the river valleys in New England, there is much land too sandy for the profitable production of crops. Throughout the glaciated portion of the Belt, moreover, especially in the Great Lakes states, there are many areas of peat and muck unsuited to crop production without drainage. The soils derived from granite in the Appalachian portion and in northern Wisconsin frequently are not fertile, and large areas are allowed to remain in forest (see Figs. 6 and 9).[5] Such land, however, when not too steep or stony, can be made quite productive by dairying involving the purchase of millfeed, or by the direct use of fertilizer.

The best general farming soils in the region are those derived from limestone. Such soils are found in central and southern Minnesota, western, southern, and eastern Wisconsin, southern Michigan, southern Ontario, the central lowland of New York, and most of the Hudson, Champlain and St. Lawrence Valleys. In these areas agriculture is reasonably successful and normally prosperous; whereas in the sandy areas, except in those places where certain specialized crops, such as potatoes, truck or tobacco are grown, and often also in the areas of gravelly or stony loams derived from granite or metamorphic rocks, agriculture has not been prosperous lately, and the acreage in crops tends to contract.

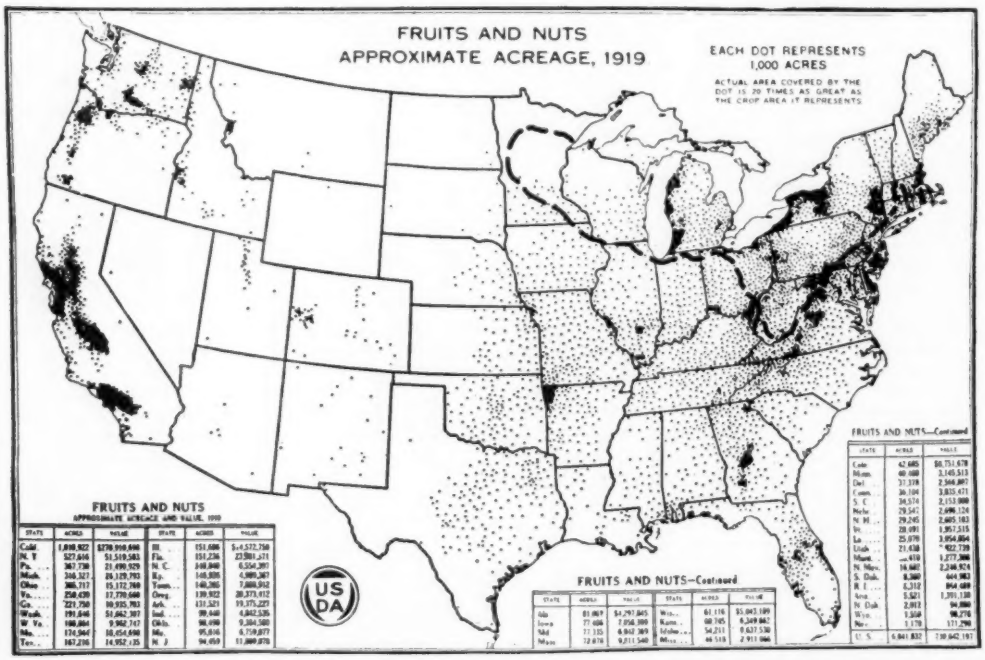


FIGURE 138.—The Hay and Dairying Belt contains several of the most noted fruit districts in North America—the Annapolis Valley in Nova Scotia, the Hudson Valley, the lowland of western New York and southern Ontario, the Lake Erie Shore of Ohio, the upper Ohio Valley district, and the Lake Michigan shore of Michigan. The large bodies of water lengthen the frost-free season on the leeward shores and moderate the winter temperatures. In Wisconsin and Minnesota the winters are too cold for the extensive production of fruit, except cherries in the Door and Bayfield peninsulas of Wisconsin and small fruits in several localities. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

[5] ECONOMIC GEOGRAPHY, October, 1926, issue, "Agricultural Regions of North America," Part I, by the author.

UTILIZATION OF THE LAND

Practically the entire Hay and Dairying Belt was originally covered with forest, and the clearing of the forest for crops and pasture has been a slow and laborious process. In the United States portion of this region about 28 per cent of the land area, or 50,000,000 acres, is now in crops, 16 per cent is in pasture (excluding woodland pasture), and about 50 per cent is forest or cut-over land; the remaining 6 per cent is occupied by roads, railroads, cities, villages, or lying waste. In the Canadian portion of the Belt about 32 per cent of the land area, or 15,500,000 acres, is in crops, 20 per cent is in pasture, and about 43 per cent is forest or cut-over land. The higher proportion in crops and pasture in Canada than in the United States, is probably to be ascribed in part to the fact that the Canadian portion is mostly level to rolling lowland (St. Lawrence Valley and Lake Plains of Ontario). However, in Quebec the population pressure has caused, and still is causing, poorer land to be brought into agricultural use than is occurring probably anywhere in the United States at present. The Canadian census shows a considerable increase in crop acreage each decade in Quebec, whereas in all the other Eastern Provinces a decrease is indicated since 1911—in Nova Scotia since 1901. In the Hay and Dairying Belt as a whole, about 29 per cent

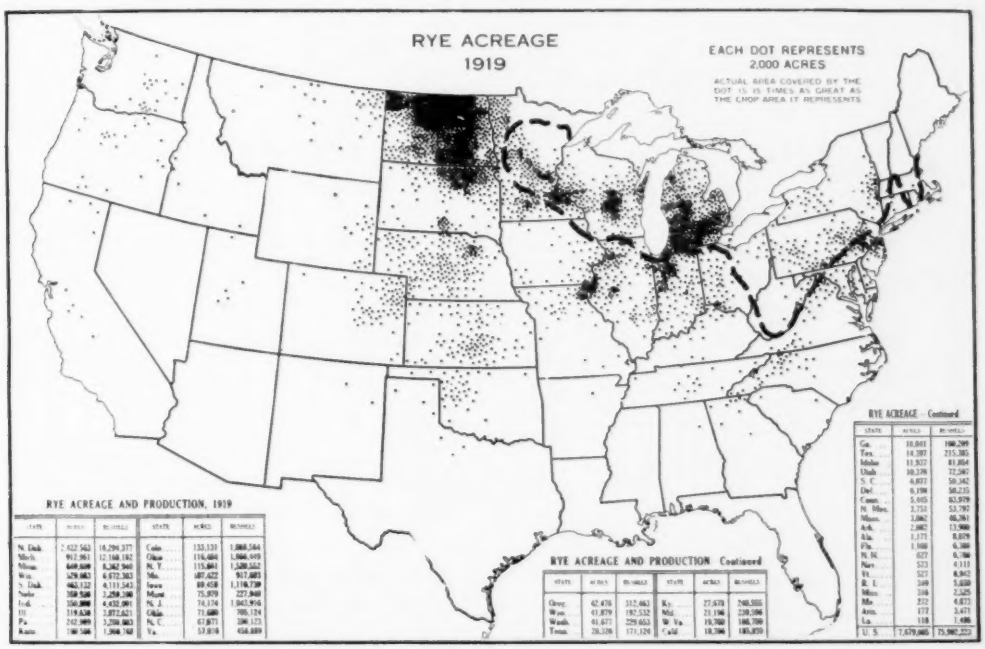
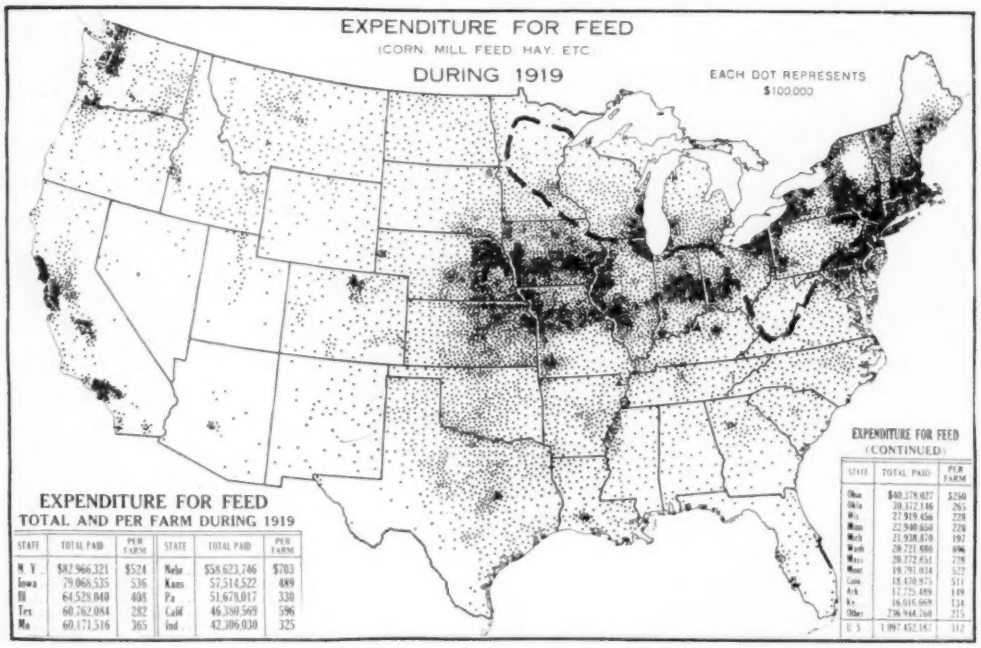


FIGURE 139.—Most of the rye in the Hay and Dairying Belt is grown in districts of sandy or loamy soils, notably in western Michigan, central Wisconsin, and east central Minnesota. The crop is also grown on heavier soils that have been depleted of their fertility by poor farming methods. Prior to the Great War, nearly all the important rye districts were located in the Hay and Dairying Belt, where the cool, moist climate favored the crop; but the high prices during war times prompted the extension of production into the somewhat drier Spring Wheat region, and in 1919 the principal rye-producing district was in central North Dakota. The production in Michigan, however, was almost as great as in North Dakota. (Map from 1921 Yearbook, U. S. Dept. of Agr.)



EXPENDITURE FOR FEED
TOTAL AND PER FARM DURING 1919

STATE	TOTAL PAID	PER FARM	STATE	TOTAL PAID	PER FARM
N. Y.	$82,966,321	$524	Nebr.	$58,623,746	$703
Iowa	79,066,535	536	Kans.	57,514,522	489
Ill.	64,525,840	408	Pa.	51,678,017	330
Tex.	60,762,084	282	Calif.	46,380,569	596
Mo.	60,171,516	365	Ind.	42,306,030	325

EXPENDITURE FOR FEED
(CONTINUED)

STATE	TOTAL PAID	PER FARM
Ohio	$40,378,027	$250
Okla.	30,372,146	265
Wis.	27,919,456	228
Minn.	22,940,650	228
Mich.	21,938,870	197
North Dak.	20,721,886	696
Mass.	20,272,851	278
Miss.	19,791,034	322
Colo.	18,430,975	511
Ark.	17,725,489	149
Ky.	16,616,669	134
Other	236,944,268	215
U. S.	1,097,452,187	312

FIGURE 140.—The expenditure for feed is very heavy in New England and New York, largely for hay from Ohio and Michigan, corn from Illinois and Iowa, and mill feed from Minnesota and the Dakotas. The grain, having a higher value per unit of weight, can be shipped farther than the hay. Much more hay is grown in New York and New England than is imported, but it is probable that more corn and mill feed is shipped in from the West than is grown locally. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

of the land area is in crops, 17 per cent is in pasture, and nearly 50 per cent is forest or cut-over land.

In the United States portion of the Belt, about 28 per cent of the land area, or 50 million acres, is potentially arable, that is, can be cleared and used for crops or pasture when the price of farm products justifies the cost. In other words, the physical conditions would permit doubling the present crop area. The clearing of the forest and cut-over land, however, is progressing very slowly. The most rapid progress is being made in northern Minnesota and Wisconsin; whereas in Michigan agricultural development on the whole is stationary, and in New England and parts of New York and Pennsylvania some of the poorer pasture lands have been allowed to revert to forest. Between 1920 and 1925 the acreage in crops in the United States portion of the Belt decreased several million acres.

For the Canadian portion of the Belt, separate estimates of potentially arable land are not available for the parts of the provinces included in this Belt, but it is probable that about the same proportion of the potentially arable land remains unused for crops as in the United States.

The Crops

Of the five major crops—cotton, corn, wheat, oats, and hay—that jointly constitute 87 per cent of the acreage of all crops in the United States, only hay and oats are grown throughout the region. The climate is, of course, too cold for cotton, and it is too cool also for corn grown for grain to be an important crop, except along the southern border and on the

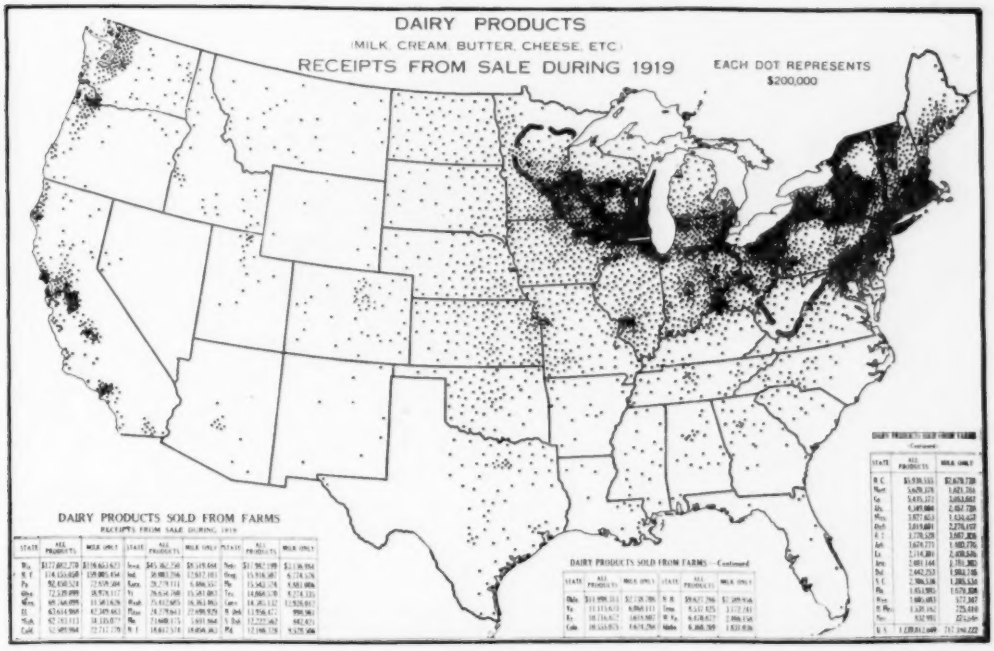


FIGURE 141.—This map shows the commercial dairying districts. The concentration of receipts from sale of dairy products in the Hay and Dairying Belt is much greater than that of dairy cattle (Fig. 131). The dairy centers adjoining Boston, New York City, Buffalo, Cleveland, Detroit and Chicago represent market milk mostly, in fact, most of the milk now produced in New England, New York State, Northwestern Ohio, eastern Michigan and northern Illinois is shipped to the cities for domestic use. The milk produced in Wisconsin, Minnesota, and northeastern Iowa, being more remote from market, is used mostly in the production of butter (Fig. 142), cheese (Fig. 143), and condensed milk. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

lee shores of the lakes. This is true also of winter wheat, while spring wheat, apparently, cannot be grown successfully in competition with the regions of drier climate farther west. Corn for silage could be grown throughout the Belt, but it is important as yet only in the western portion—southern Michigan, Wisconsin, and Minnesota (Fig. 135). On the other hand, both climate and soils are well adapted to hay and oats. These two crops constitute nearly two-thirds of the total crop acreage in the region (hay 50 per cent and oats 15 per cent); whereas corn (for all purposes) and wheat, which are grown mostly in the southern portion of the region, occupy 14 and 7 per cent respectively of the crop land, rye grown on the sandy soils 4 per cent (Fig. 139) and the fruits, potatoes, and vegetables occupy, in all, only 8 per cent. The potatoes are grown principally on the sandy or loamy soils, the fruit mostly along the lake shores and on the mountain slopes where there is less danger from frost, and the vegetables near the cities or where the transportation facilities are good (Figs. 136, 137, and 138).

This Hay and Dairying Belt contains half of the urban population of the United States, and over three-fourths that of Canada. With such large markets at hand it seems worth while to inquire why nearly four-fifths of the crop land should be in hay and oats, supplemented by corn along the southern margin, crops not used directly for human food (except oats and corn to a very small extent),

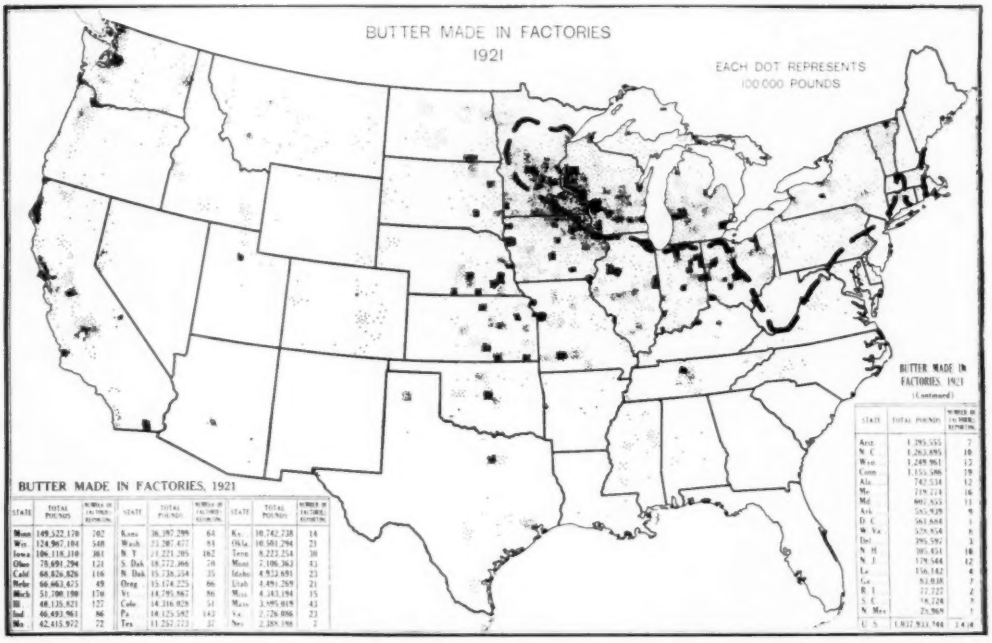


FIGURE 142.—A considerable quantity of creamery butter is made in Vermont, in the St. Lawrence Valley, in New York, and in Michigan; but the great center of butter production consists of southern Minnesota, western Wisconsin, and northeastern Iowa. The production of butter is increasing also in the Corn Belt and along the Pacific coast. The spotted character of the map, especially in the Corn Belt, indicates the concentration of butter making in a relatively few cities to which the cream or butter is shipped from the farms. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

and, in the case of hay, requiring relatively little labor per acre of land; while only one-fifth of the crop land is in wheat, rye, potatoes, vegetables, fruits, and other crops used mostly for human food and requiring more intensive cultivation. The answer is to be found partly in the conditions of climate, land surface and soils, and partly in the economic conditions, especially the low cost of transportation in America and the high cost of labor.

First, the climate is adapted to hay and pasture and is a little too cool for corn or winter wheat, except along the southern margin, as already noted. Spring wheat can be grown, but is subject to rust, and must meet the competition of the larger fields and freer use of machinery farther west.

Secondly, many of the stony hillside fields, especially in the eastern portion, and the shallow limestone soils, are difficult to plow, and if plowed, some of the soil might wash away. These are not suited, therefore, to corn and wheat, but are kept in meadow indefinitely. Moreover, many of these fields are too small to permit advantageous use of modern harvesting machinery.

Thirdly, even for hay and feed the region is a deficit area. Considerable quantities of hay are imported from the eastern Corn Belt, especially by New York and New England. Large quantities of corn and mill feed are also brought in from the West (Fig. 140). The price of these products in this eastern section of the region, therefore, is the price in the Corn Belt or the wheat regions plus the cost of transportation and middle-men's charges. As hay and

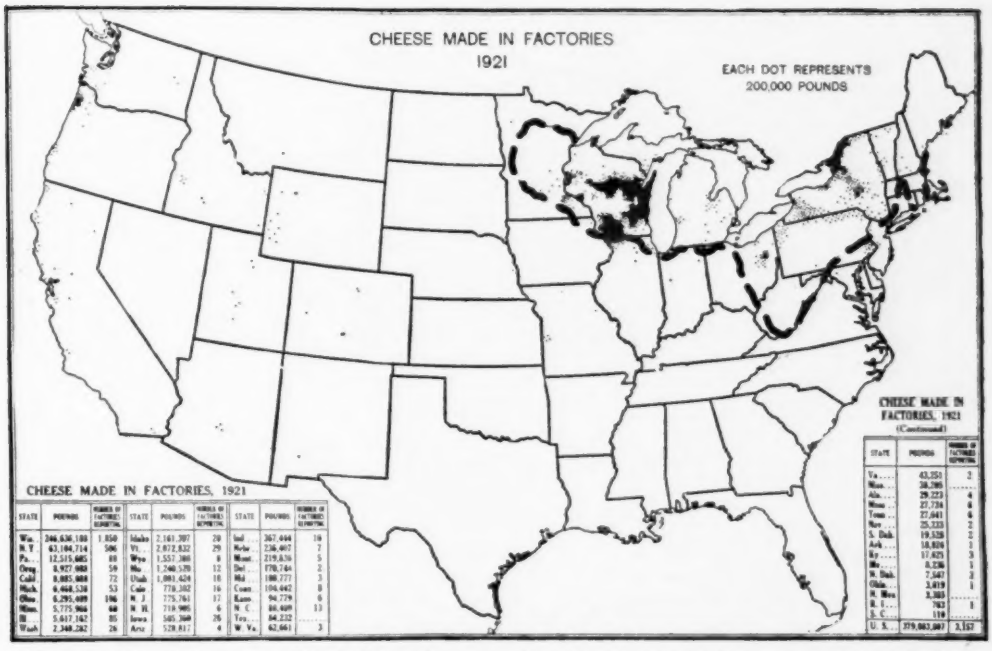


FIGURE 143.—About two-thirds of the cheese produced in the United States is made in Wisconsin and half of the remainder in New York. Cheese is also made in Ontario and Quebec. Cheese production has developed in those parts of Wisconsin, and New York, having less than 150 days in the frost-free season, except in the sandy central portion of Wisconsin, which has poor pastures. The short, cool season favors summer pasture and cheese production, just as corn silage, winter dairying, butter making, skim milk, hogs and corn complete the economic cycle in the warmer belt to the south. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

oats are bulky and have less value per unit of weight than wheat and mill feed, the transportation charges operate like a protective tariff, and permit a larger production of these coarse feeds than of products having a higher value per unit of weight. The average farm price of hay in New York State, for instance, during the past 10 years was 35 per cent higher than in Iowa, and in Massachusetts was 87 per cent higher; whereas the farm price of wheat in New York was only 11 per cent higher than in Iowa and in Vermont was 12 per cent higher (no Massachusetts figures available).

Fourthly, the competition of the city industries for labor, and consequently the high wages paid, prompt the farmers to do as much of the farm work as possible themselves. Pasture requires almost no attention, and hay the least labor of any of the crops.

A fifth reason for the dominance of hay and pasture is the suitability of the region to dairying, which is based largely on pasture, hay and silage (which, however, constituted only 6 per cent of the hay and forage acreage in 1919). The summers are cool and the milk keeps sweet longer and is easier to handle than further south. The winters are cold and long, and dairying provides profitable employment for the farmer and his family during these months when labor is not required by the crops. The farmer may not receive as much for his winter as for his summer labor, but it is better than nothing. This makes it more difficult for other regions to compete in the production

of dairy products. And in summer, when the crops require labor, the cows can be kept on pasture and given relatively little attention.

Finally, market milk is bulky and perishable, consequently little of it, except in New York and New England, is shipped more than 100 miles. The great needs of the population concentrated in New York and southern New England pushes the price of milk to such a point that it pays to import it even from Canada. Chicago now, since milk from tuberculin tested cows is required, is reaching out for milk several hundred miles, every farm in this portion of the region. The value of the milk and dairy products used annually on the farms would average fully one hundred dollars more. Farm butter is made principally in Pennsylvania, eastern Ohio and Michigan, central Ontario and Quebec; and factory butter mostly in Minnesota, Northeastern Iowa, Wisconsin, southern Michigan, Ontario, and northern Vermont (Fig. 142). These districts of factory production are more or less remote from market, partly because butter, having a higher value per unit of weight than milk or cheese,

FIGURE 144.—Dairy cattle on pasture, Prince Edward Island, one of the best dairying districts in North America. The gently sloping character of the land is typical of the island and the houses in the distance are all painted white. (Photo from Natural Resources Intelligence Service of Canada.)

especially along the principal lines of railways.

The Belt produces more rye and potatoes than it consumes, largely because the climatic conditions are favorable, and it also contains many of the largest vegetable and fruit districts in the United States. Like England it depends upon other regions primarily for its bread and its meat, and for the same reasons.

Livestock

The receipts from sale of milk and dairy products in the United States portion of this region amounted to over 600 million dollars in 1919, fully half the total for the United States (Fig. 141). This is nearly $600 for

can better stand the cost of transportation. Almost no cheese is now made on the farm, and the factory production is concentrated in Wisconsin and northern New York, which states produced 80 per cent of the cheese made in the United States in 1919 (Fig. 143). Very little butter and practically no cheese is made around Boston, New York City, Buffalo, Cleveland, Chicago, or the other large cities, the milk being shipped to the cities for domestic use.

The Hay and Dairying Belt includes less than one-tenth of the land area of the United States; yet it possesses about one-third of the dairy cows, one-sixth of the horses and poultry, one-eighth of the sheep,

FIGURE 145.—A characteristic scene in Nova Scotia—opening up the piles of hay to dry. Note the V-shaped valley being cut into the plain and the intermingled forest and pasture on the valley slopes; also the evergreen forest along the sky line. Most of Nova Scotia is covered with forest. (Photo from Natural Resources Intelligence Service of Canada.)

and one-ninth of the swine, but less than one-twentieth of the beef cattle. Beef is produced where the feed is cheaper. Poultry are as important as dairy cattle near many of the large centers of population, especially in southern New England. The region contained about 17,000,000 animal units on January 1, 1920, an average of 60 animal units per square mile. In some of the richer counties, however, there were over 100 animal units per square mile, which is as high as in the best counties of the Corn Belt.

REGIONAL VARIATIONS IN AGRICULTURE

Although hay, pasture, and dairying characterize the region throughout, the differences in soils, and the difficulties of using modern farm machinery in the mountainous eastern portions, as contrasted with the St. Lawrence Valley, the lake plains, and the level to rolling lands in the West, also differences in duration of settlement and in density of population, have resulted in variations in crops and livestock produced and in systems of farming. On this basis the Belt may be divided into five sections: (1) The St. Lawrence Lowland; (2) The Northern Appalachian section, which includes the Maritime Provinces and the adjacent hilly portion of Quebec, New England, New York (excepting the western lowland), and the glaciated plateaus of northern Pennsylvania and northwestern New Jersey, also a few counties in northeastern Ohio; (3) the Central Appalachian section, which includes most of Pennsylvania and eastern Ohio, western Maryland, and most of West Virginia, also several plateau counties in Virginia; (4) the Southern Great Lakes section, which includes the diversified farming and fruit belt of New York and Ontario, a narrow belt along the Lake Erie Shore of Ohio, most of southern Michigan and Wisconsin, and the originally forested south-

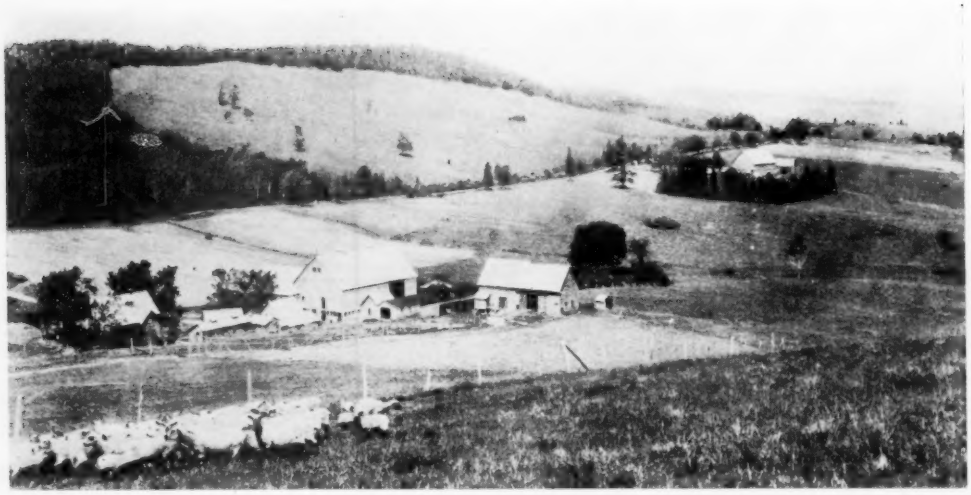


FIGURE 146.—Two modern farmsteads in New Brunswick. The barns are more modern and the surface of the land is more hilly than is typical of this province; but quite typical is the pasture in the foreground with the flock of sheep, the hay fields, and the mixed evergreen-hardwood forest in the background. (Photo from Natural Resources Intelligence Service of Canada.)

eastern portion of Minnesota, together with the northeastern corner of Iowa, and a narrow strip along the northern borders of Illinois and Indiana; (5) the Northern Great Lakes section, which consists of the northern and north-central portions of Michigan and Wisconsin and northeastern Minnesota, excluding the Iron Ranges in Michigan and Wisconsin, and the stony or marshy portion of northern Minnesota, which are included in the Hay and Forest Belt to the north (Fig. 132).

The area of the St. Lawrence Lowland section is about 15 million acres, of the Northern Appalachian section about 50 million acres, of the Central Appalachian section about 40 million acres, of the Southern Great Lakes section about 70 million acres, and of the Northern Great Lakes section about 55 million acres.

(1) In the St. Lawrence Lowland section about 40 per cent of the land is in crops, nearly 25 per cent is in pasture and about 30 per cent is in forest or brush. The remaining 5 per cent is mostly idle and waste land in farms, farmsteads, roads, railroads, bare rock and area in cities and villages. Nearly three-fifths of the crop land is in hay, and nearly a third is in oats. Only 3 per cent of the crop land is in wheat, mostly spring wheat, and only one-third of one per cent is in corn for grain. Potatoes are the principal intertilled crop, occupying 2 per cent of the total crop land. The all-important live stock industry is dairying, but the maintenance of horses requires about one-fourth of the total crop acreage and much pasture also. A few hogs are produced for local use. The insufficient production of grain is supplemented by mill-feeds brought in from the West. The farmers in much of this St. Lawrence Lowland are of French origin (Brittany largely), who maintain an almost self-sufficient agriculture and a rural life much like that of their ancestors.

(2) In the Northern Appalachian area nearly 30 per cent of the land is in crops, 22 per cent in pasture, and 44 per cent in forest, of which fully a fourth is potentially arable. About

60 per cent of the crop land is in hay, grown mostly in permanent meadows, except in southern New York and northern Pennsylvania, where rotations involving a small grain and cultivated crop are common (Figs. 145, 148, 149, and 150). The hays are mostly timothy and clover, grown mixed or separately, except that in parts of New England and the Maritime Provinces the bent grasses and red top are more important. The only other crops of general importance are oats, which occupy 12 per cent of the crop land, corn, occupying 6 per cent, grown mostly in the southern portion, and potatoes which, although constituting only 4 per cent of the acreage, contribute 20 per cent of the value of all crops.

FIGURE 147.—Digging potatoes in the Aroostook district of northeastern Maine. This is the leading potato-growing district in the United States. The average yield per acre in Aroostook County is about double that for the nation as a whole, and the quality of the potatoes cannot be surpassed. (Photo by L. G. Dodge, formerly of U. S. Dept. of Agr.)

Although the acreage in corn is only half that in oats, and in potatoes only a third that in oats, the value of the corn crop is a half greater and of the potato crop is three times that of the oats crop. One-fourth of the potatoes produced in the United States are grown in this Northern Appalachian section. The cool climate, the ample area of slightly acid, sandy-loam soil, held consequently at a low price relative to its productivity, and the proximity to the largest centers of population in the country, are important reasons for so great a concentration of potato production in this section. The centers of production lie near or to the north of the centers of population (Fig. 136). The densest production is in Aroostook County in northeastern Maine, which supplies Boston and New York in part, and western New York, which district supplies Buffalo, Rochester, and Syracuse and also has a surplus for shipment to New York City and Philadelphia. In Aroostook County the potatoes are grown in rotation with clover and are the most important farm enterprise (Fig. 147). Elsewhere in the section the potato fields are generally smaller in size, and potatoes are only one of a number of important farm enterprises.

In the warmer valleys, lying below the general level of the Appalachian plateau, local industries have developed, notably fruit, truck, and flower growing in the Hudson Valley,

FIGURE 148.—Rolling country in the Allegheny Plateau district of New York (Otsego County). Note the wild daisies in the hay in the foreground, indicative of acid soil, and the bouquet-shaped elm trees along the fence lines, which are beautiful but deplete the productivity of the soil. (Photo by J. S. Cotton, U. S. Dept. of Agr.)

largely for the New York City market, and fruit alone in the Annapolis Valley of Nova Scotia and along the valleys of Pennsylvania and West Virginia. Dairying is the dominant enterprise throughout this area, except in these localities of specialized crop production (Fig. 144). The pasturage used by the cows during the summer probably contributes as much feed as the hay consumed during the winter. Large quantities of small-size lumber, pulp wood, and fire wood are still cut from farm woodlands in this Northern as well as in the Central Appalachian section (Fig. 152).

(3) In the Central Appalachian section, about 22 per cent of the land area is in crops, 21 per cent is used for pasture, and 51 per cent is forest and cut-over land. In other words, less of the land is in crops and pasture and more is in forest than in the Northern Appalachian section, where the glaciation has produced a smoother surface and fresher soil. Moreover, less than one-fifth of the forest land is potentially arable. Nearly half of the land is too hilly or infertile for crop production (Fig. 151). Corn, including fodder and silage, occupies three-fourths as large an acreage as hay, and winter wheat, which is almost entirely absent in the northern Appalachian section, becomes an important crop. In this Central Appalachian section, hay and forage crops occupy 34 per cent of the crop land, corn for grain 18 per cent, winter wheat 15 per cent, and oats 12 per cent. Fruit is locally important, especially in the limestone valleys and on the adjacent lower slopes of the mountains (Fig. 138). The production of beef cattle, swine, and sheep becomes in the aggregate as important as dairying in this section. On some of the better bluegrass pastures of the limestone valleys and

plateaus in this area beef cattle are fattened for market without supplementary grain.

The common rotation in this section is corn followed by winter wheat or spring oats with which timothy and clover are seeded. The clover gets a good start usually after the wheat or oats are cut, and becomes the principal constituent of the hay crop during the third year of rotation. The fourth year the hay is mostly timothy and the fifth year is entirely timothy. During this fifth year, and often for a year or more thereafter, the land may be pastured. Permanent bluegrass pastures, however, supply most of the pasturage in this Central Appalachian section. In some places the rotation is modified to include two years of corn, and in other places to include two years of wheat. Winter wheat is preferred in the valleys and in the southern portion where the corn can be cut and removed in the fall in time to seed wheat; elsewhere oats, sown in the spring before corn planting time, and harvested in the summer after corn cultivation is past, are generally used in the rotation.

(4) In the Southern Great Lakes section, 50 per cent of the land is in crops, 20 per cent is pasture, and 25 per cent is forest. It will be noted that the proportion of land in crops is about twice that in the Appalachian sections, whereas the proportion in forest is only half as great. Moreover, two-thirds of the forest land is potentially suitable for crops. In other words, 80 to 90 per cent of the land is potentially arable. Although hay is, in general, the principal crop, and dairying the dominant farm enterprise, the agriculture is more diversified than in the eastern areas. Along the lee shores of the lakes, notably in western New York and southern Ontario, in northern Ohio and western Michigan, the protection from frosts and low winter

FIGURE 149.—A typical farmstead in Chenango County, New York, with another farmstead just behind it. Note the small orchard in the foreground, the hay recently cut, and the silo beyond, which suggests a warmer climate, better adapted to corn production than that of the districts previously pictured; also the forests on the steeper slopes of the hills in the distance. (Photo by J. S. Cotton, U. S. Dept. of Agr.)

temperatures afforded by the water has led to the development of the fruit industry (Figs. 153 and 154). In the western New York lowland, fruit is generally only one enterprise in a highly diversified agriculture, which commonly includes the growing of hay, wheat, corn, oats, potatoes, and, on many farms, beans also. Peas, cabbage, sweet corn, tomatoes, and other truck crops, whose production is favored by the climate and soils, and also by the large nearby markets, are important specialized enterprises (Fig. 137). In this district dairying although highly developed, is not dominant.

Southern Michigan resembles the lowlands of western New York in the diversity of its agriculture. Here also field beans become an important crop, New York and Michigan producing over a third of the nation's crop; and, in addition, sugar beets are grown extensively, especially in the region around Saginaw. Sugar beets are grown where the mean summer temperature is between 67 and 72 degrees, and find in southern Michigan, northwestern Ohio, and in southern Wisconsin and Minnesota the requisite sunshine lacking in New York.[6]

[6] See "The Michigan Sugar Beet Industry," by F. A. Stilgenbauer, in October, 1927, issue of ECONOMIC GEOGRAPHY.

In Wisconsin dairying is the dominant industry, based largely on pasture in summer and hay and corn silage for winter feed. The common rotation is corn, oats, hay, with sometimes a fourth year for pasture, but most of the pasturage is provided by permanent bluegrass sod on the poorer or rougher lands. The wild grasses of the muck or marsh lands are also used for hay and pasture. Wisconsin produces two-thirds of the nation's cheese, and ranks second among the States in the production of butter (Figs. 142 and 143). In southeastern Minnesota the production of spring wheat and barley has largely given place to dairying, and Minnesota now produces more butter than any other state.

FIGURE 150.—Loading hay with pitchforks in northeastern Ohio—a typical scene in the northern Appalachian section of the Hay and Dairying Belt. (Photo from U. S. Dept. of Agr.)

Most of the butter consumed in the cities of the United States is produced in this Southern Great Lakes section and the adjacent Corn Belt, while the production of cheese is practically confined to this Great Lakes section and to the highlands and St. Lawrence Valley of New York. Butter and cheese are produced in larger quantities in these regions more remote from market than the Appalachian sections, because both have high value per unit of weight and are not perishable if kept cool. Butter can be shipped from Minnesota or Wisconsin to New

FIGURE 151.—A typical valley in the Allegheny Plateau portion of West Virginia. Note the patch of corn in the foreground, partly shocked, the few apple trees in the pasture, and the forest-clothed slopes in the background, typical of the rougher part of the central Appalachian section. (Photo by J. S. Cotton, U. S. Dept. of Agr.)

York and Boston for about 1 per cent of its farm value, and cheese for about 2 per cent; whereas to ship whole milk would cost from 50 to 100 per cent of its farm value, and it then might not arrive in fresh condition in the summer season. So market milk is produced mostly in the eastern sections of the Hay and Dairying region where there are many large cities, and in the Great Lake sections, except near the cities, most of the milk finds its way to market in the concentrated form of butter and cheese. However, 40 per cent cream is now being shipped regularly to New York and Boston from Wisconsin, indeed, from as far as Wichita, Kansas (rate is $2.30 per 10 gallon can), and whole milk has been shipped during the winter from Wisconsin to Miami, Florida.

Along both the Michigan and Wisconsin shores of Lake Michigan, trucking has become an important type of farming; and inland in south-central and northwestern Wisconsin and in eastern Minnesota the production of cabbage and of peas and sweet corn for canning have become important local industries (Fig. 137).

(5) The Northern Great Lakes section includes the sandy areas of northern lower Michigan, central Wisconsin, and east-central Minnesota, and the more recently settled northern portions of these states. The pastures in the sandy areas are poor and the hay lands less fertile than in the limestone lands to the south, so dairying gives place in part to the production of potatoes and rye. Most of the potatoes consumed in the cities of this western Hay and Dairying region, in the Corn Belt, and to the south, come from these

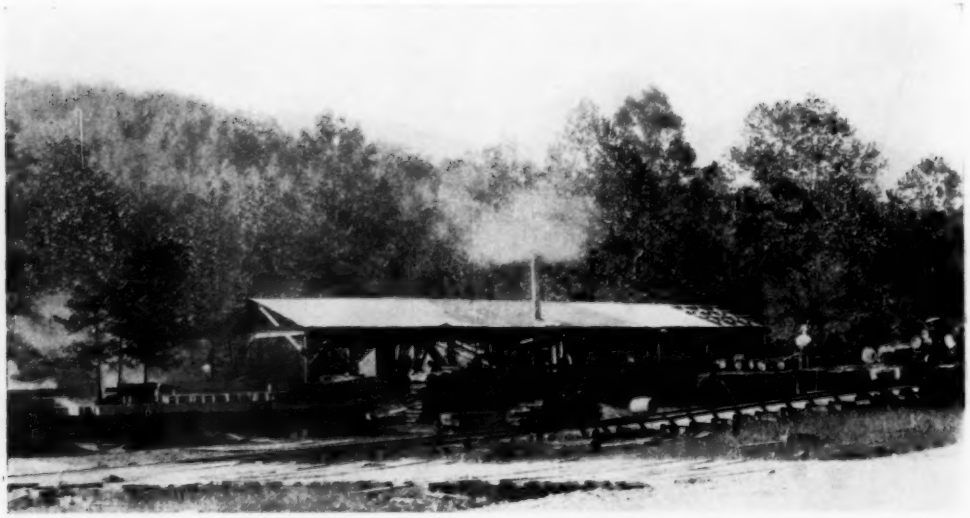


FIGURE 152.—A small sawmill in central West Virginia. Much timber and even more poles, ties, and firewood, are still cut in the Hay and Dairying Belt, especially in the northern and central Appalachian sections. Owing to the small amount of timber available in any locality, however, small outfits such as this, which can be moved without great expense, are commonly used rather than the large sawmills found in the South and Pacific Coast. (Photo by J. S. Cotton, U. S. Dept. of Agr.)

sandy areas, and they contribute also about one-third of the rye crop of the nation (Figs. 136 and 139). The system of farming is very different from that in the surrounding dairy region, being based on these two crops and corn, with a little red or mammoth clover, sometimes grown in rotation with the potatoes.

The northern portions of Michigan, Wisconsin, and Minnesota are still largely in the pioneer stage of development, and owing to the cooler climate and generally heavier soils, often derived from granite or metamorphic rock and frequently stony, are developing systems of agriculture differing somewhat from those in the section to the south. Hay and pasture are as dominant as in the Northern Appalachian section, and potatoes and oats, similarly, are important crops. On the heavier soils of this northern region, dairying is the dominant industry, based on pasture and hay, mostly timothy and clover mixed, supplemented by silage. Oats are grown for the horses, peas constitute a considerable acreage in several counties, and a few farmers raise barley or spring wheat.

In this Northern Great Lakes area the farms for the most part are scattered amongst the timber and cut-over land (Fig. 155). Only 17 per cent of the land area is in crops, and 7 per cent is in pasture. About 75 per cent is forest and cut-over land, of which over half is potentially arable. The acreage of cleared land in many of the farms in the cut-over districts, as in the Appalachian sections, is too small to provide a comfortable living, often being only 15 to 30 acres.

Settlement is advancing slowly in northern Wisconsin and northern Minnesota, but in the sandy central portion of Wisconsin and of the north-central portion of the lower peninsula of Michigan, also in the upper peninsula, except the westernmost counties, very few new farms are being carved out of the forest,

and in several counties cleared land is reverting to forest (Fig. 156).[7]

SIZE AND TENURE OF FARMS

The farms in this Hay and Dairying region, owing in part to the high cost of clearing the land when the region was settled, and in part to the intensive dairying, fruit growing, and trucking industries, are smaller than in the other agricultural regions, except the Cotton Belt and the Pacific Subtropical Crops region. In the St. Lawrence Lowland the average farms were approximately the same size (107 acres). About 36 acres were devoted to crops, 29 acres to pasture, and 30 acres to forest. In the Southern Great Lakes section the farms averaged 105 acres, but there were 60 acres of crops per farm, 18 acres of pasture, and 15 acres of woodland. In the Northern Great Lakes Section, although the farms averaged 121 acres in size, only 46 acres were in crops, and 18 acres in pasture, most of the remainder being cut-over land growing up to aspen or

FIGURE 153.—Two-year old apple orchard, interplanted with beans, in the lowland of western New York. Note the almost level land and the characteristic Norway spruce trees planted around the farmstead. (Photo by E. H. Thomson, formerly of U. S. Dept. of Agr.)

area per farm in 1921 was 123 acres, of which 52 acres were in crops, 34 acres in pastures, and 28 acres were in woodland. The remaining land in the farm consists of the farmstead, roads, lanes, idle and waste land. In the Northern Appalachian section the farms averaged 112 acres in size in the year 1919, of which 37 acres were in crops, 24 acres were in pasture and 30 acres in forest. In the Central Appalachian section, the pine forest. It will be noted, however, that this newly settled northern lakes section has more crop land per farm than the long-settled Appalachian areas to the east.

The so-called abandonment of farms in the Appalachian areas, which in many cases is merely an abandonment of some of the farmhouses and of the poorest, most stony land, is an attempt to adjust the size of farms to the use of modern machinery and the larger income and higher standard of living which has resulted from the competition of the cities for the rural labor. This involves usually the reversion of some

[7] In Adams County, central Wisconsin, a county of sandy soils, the men on the soil survey, in progress a few years ago, counted 239 vacant houses; these do not all indicate abandoned farms for the land on which they were built may now be part of an adjoining farm.

of the poor or hilly crop land to pasture, in order to conserve labor, and even more frequently the reversion to forest of some of the poorer pasture lands. It is difficult to utilize some of the hill lands for crops in competition with the level lands of the West. In the valley lands, on the other hand, the trend is toward smaller farms and more intensive cultivation, notably the production of truck crops, tobacco, and fruit. In other words, there is a notable tendency toward cultivating more intensively the more fertile or favorably located land, and toward farming less intensively the less fertile and less accessible uplands, that is, using them for pasture and forest.

FIGURE 154.—Vineyards east of Hamilton, Ontario. With Lake Huron on the northwest to moderate the cold waves of winter, and with Lake Ontario on the south to cool down the warm waves of spring that might cause the trees and vines to bloom before danger from frost is past, and with a level, loamy soil and large city markets nearby, southern Ontario is one of the most favorably conditioned fruit districts in North America. (Photo from Natural Resources Intelligence Service of Canada.)

In southern New England a very interesting development is in progress. The 1925 Census reveals, for the first time in 40 years, an increase in number of farms in many counties. This increase is owing mostly to the purchase of farmhouses, often not occupied, and a few acres of land adjoining, by factory employees, business and professional men from the cities, who are able to go back and forth from work in their automobiles or by bus or interurban car. The land can be bought and the house repaired for much less than it would cost to build an equally good house in the city. The garden, a few acres of hay, and the cow that is often kept yield products valued in excess of $250, and so meet the census definition of a farm. A similar movement is now occurring in southern Michigan. The inclusion of these almost suburban farms in the Census returns tends to reduce the average size of farms in these areas, as reported by the Census, and sometimes masks a significant increase in size of the real farms.

In the Southern Great Lakes section the farms remained at about the

FIGURE 155.—Western sheep on cut-over land pasture in north-central Michigan (near Prescott). Note the excellent grass, the stumps and young forest in the background, with a few dead trees (probably killed by fire) rising above the young growth. (Photo by J. S. Cotton, U. S. Dept. of Agr.)

same size for 40 years prior to 1919. Lately, however, there has been a large migration from the farms to the cities, especially in Michigan, and this has resulted in the consolidation of many farms and the partial abandonment of one set of buildings. It appears that in this section also the trend is now toward the less intensive utilization of the less fertile or more remote land, and toward expansion of the acreage in vegetables and other intensively cultivated crops near the large cities.

In the Northern Great Lakes section the average acreage of land per farm remains about constant, but the improved land per farm has increased rapidly. In other words, the farmers are not enlarging their holdings, but are clearing out the stumps and otherwise improving their land. In northern Minnesota and Wisconsin the number of farms also increased rapidly between 1910 and 1920, and this was true likewise of the western counties in the upper peninsula of Michigan; but in the northern portion of the lower peninsula many counties had fewer farms in 1920 than in 1910. The 1925 Census shows a continuation of this downward trend in number of farms in the lower peninsula and upward trend in much of the upper peninsula and in northern Wisconsin and Minnesota. This results in a trend toward larger farms in the southern portion of the Great Lakes states and toward smaller farms, on the average and temporarily, in the northern portions of these states.

LAND TENURE

Over 80 per cent of the farms in the Hay and Dairying region are operated by owners, as compared with less than 60 per cent in the Corn Belt. In New England 90 per cent of the farms are operated by owners, which is the highest percentage in the United States; in New York, Michigan, and Wisconsin about 80 per cent of the farms are operated by their owners; in Pennsylvania and Minnesota about 75 per cent. In Ontario, where the systems of farming and the people are very similar to those in New York, about 90 per cent of the farms are operated by owners; in Quebec, largely French Canadian, 97 per cent, and in the Maritime Provinces, largely Scotch, 98 per cent.

It is interesting to note that the average value of the farm buildings was almost as great in 1920 in the

Hay and Dairying Belt as in the Corn Belt, and four times the average value in the Cotton Belt. Dairying requires as good buildings as the beef cattle and hog enterprises; and, moreover, farmers in the Hay and Dairying region mostly own their homes and are not content with such structures as suffice for the tenant farmers in the Corn Belt. Most of the farms in the Hay and Dairying region apparently do not yield sufficient income to permit the owner to move to town and rely on rent from the farm for a living; consequently he remains on the farm and is inclined to make life as comfortable as his income permits.

Moreover, dairy farming does not lend itself to tenancy so well as corn and hog production. The dairy tenant must invest more capital in the cows than the Corn Belt tenant in hogs, and he need operate less land. Fruit and vegetable production is even less adapted to tenancy. An inexperienced tenant might do more injury to an orchard in a few days than the owner could repair in many years.

FIGURE 156.—An abandoned church on the sand plains of north central Michigan, a monument to man's folly in trying to farm poor sandy land. Note the soil blown away from the stumps, the sand piling up to the right of the church, and the young forest in the distance creeping back over the land. (Photo by C. R. Ball, U. S. Dept. of Agr.)

THE PEOPLE

The dominant racial stock of the St. Lawrence Lowland is French Canadian. In the Northern Appalachian section most of the farmers are of New England ancestry, except in the Gaspé Peninsula of Quebec and in northeastern New Brunswick, which are French Canadian. Large numbers of Canadians, both of English and of French origin, are also found throughout the northern portion of the section, especially in New England. Many Irish farmers are located in New York and eastern Massachusetts. Recently a number of Italian and Polish people have purchased farms in southern New England and New Jersey. On the poorer soils and in the trucking district these foreign peoples appear likely to replace the old New England stock.

In the Central Appalachian area people of native American and of Pennsylvania German stock constitute nearly all of the farm population. Recent immigrants have not, as yet, taken to farming in appreciable numbers. In the Great Lakes sections farmers of German origin are very numerous in eastern Wisconsin and southeastern Minnesota, while Scandinavian farmers are found in western Wisconsin and central and western Minnesota. In Michigan the farmers are mostly of native American stock, except in the "Thumb" district where English Canadians predominate. In northern Minnesota there are several interesting settlements of Finns and Bohemians. Some Finnish settlements have been made in Massachusetts also.

Religion and Education

The French Canadian farmers in this Hay and Dairying Belt, almost without exception, are devoted followers of the Catholic Church, and so, likewise, are most of the Irish farmers. The farmers of old New England ancestry are Protestants, mostly Congregationalists, Methodists, Baptists, or Episcopalians. The English Canadians are largely Presbyterians, Methodists, Baptists, Episcopalians, and United Brethren. The Germans and Scandinavians are mostly Lutherans. In all these racial groups there are also a few Catholics.

Education among the French Canadians in Canada is almost wholly under the control of the Church, and in parochial schools. In the United States many French Canadian children attend the public schools, but parochial schools are also maintained in French Canadian communities. Most of the Irish children, although strongly Catholic, attend the public schools. Practically all children of Protestant farmers attend the public schools.

Illiteracy in Maine averaged 3.1 per cent for the rural population in 1920, ranging from 1.6 per cent for native white of native parents, mostly old New England stock, to 9.6 per cent for foreign-born, mostly French Canadians. The corresponding figures for Massachusetts are 3.0 per cent, 0.5 per cent, and 12.6 per cent; for New York state, 2.9 per cent, 1.0 per cent, and 13.5 per cent; for Michigan, 2.5 per cent, 0.8 per cent, and 8.9 per cent; for Wisconsin 2.3 per cent, 0.7 per cent, and 7.7 per cent; for Minnesota 1.8 per cent, 0.3 per cent, and 5.5 per cent. It appears that throughout the Belt the percentage illiterate among the native white of native parentage is low, mostly under one per cent; but among the foreign born is high, from 5 to 15 per cent. There is less illiteracy in the western portion of the Belt than in the eastern.

Trend of Population

The farm population of the region as a whole is decreasing. Statistics of farm population were tabulated separately for the first time in 1920, and then only by states; but the number of farms, or farmers, is available each decade, and affords a basis for estimating farm population.

The farms in the United States portion of the region decreased about 70,000, or over 5 per cent between 1910 and 1920. In the United States portion of the Northern Appalachian section the decrease was 11 per cent; in the Central Appalachian section, 8 per cent; in the Southern Great Lakes section, 4 per cent; while in the Northern Great Lakes section there was an increase of 18

per cent. The Wisconsin and Minnesota portions of this northern section seem likely to continue slowly developing agriculturally for many years.

This decrease in numbers of farms does not represent fully the decrease in population since the Census shows a much greater decrease in farm laborers than in farmers, and the average size of the farm family also is decreasing. The decrease in farm population between 1910 and 1920 in the Belt may be estimated at about 7 per cent.

But there was no diminution of agricultural production because of this decrease in population in nearly all the Belt. Instead the acreage of crops harvested in 1919 was 11 per cent greater than in 1909. Owing to the decrease in farms, the increase in crop land per farm was greater—15 per cent. This increase of crop land was principally at the expense of pasture, improved pasture decreasing fully a quarter during the decade. The farmers concentrated their labor on the better land and produced more crops than ever before. With increased yields per acre offsetting the loss of pasture, this 15 per cent may be considered to measure roughly the increase in efficiency of the farmers of the region between 1909 and 1919.

Between 1919 and 1924 the Census shows less decrease in crop acreage in the United States portion of the Hay and Dairying Belt than in any other agricultural region in the originally forested portion of the United States. Increases almost balanced decreases in the counties of New England and Wisconsin, and the notable decrease in Michigan also was almost balanced by the increase in Minnesota. The decrease in farm population between January 1, 1920, and 1925 was only one per cent in the region as a whole, but all states showed a decrease, except the New England states, in which the farm population increased about seven per cent. Doubtless a large part of this increase in New England consists of "amphibian" farmers, as Professor Davis, of Connecticut, has called them—factory employees, business and professional people, who live on small tracts of land and with the aid of their families cultivate a garden, raise a little hay and keep a cow. Though normally employed in the city, when work is slack in the city they may devote all their time to the "farm."

ECONOMIC SITUATION

Farming in the region has been prosperous, as compared with other parts of the United States, and fewer people have left the farms for the cities, despite their proximity, than in any other agricultural region, except the Pacific Subtropical Crops Belt, the western portion of the Corn Belt, and the eastern portion of the Corn and Winter Wheat Belt. Alone among the major agricultural commodities, the prices of milk and dairy products have been maintained since 1920 at that level which would permit the dairyman to purchase almost as many other commodities as he was able to purchase during the five years before the Great War (1909–1913). Indeed, owing to a notable advance in the efficiency of dairy cows in transforming feed into milk, and to the relatively lower prices of corn and mill feed than of milk, the dairyman in the eastern portion of the Belt has been more prosperous probably than before the War. The Hay and

Dairying Belt, except in Michigan and parts of New York and Pennsylvania, has scarcely felt the agricultural depression, a depression that has been little less than a calamity to millions of farmers in other portions of the United States.

The farmers of this region are conservative by nature—New England people, Scotch, English, and French Canadians. Moreover, dairying is, perhaps, the most stable agricultural industry. Add to this a price for milk and butter about equal in purchasing power to the pre-war price and it can be understood why the farmers of the Hay and Dairying Belt have failed to rally to the support of their brethren in other regions in advocating unusual legislative action for the alleviation of the agricultural distress.

COTTON MANUFACTURING: NORTH AND SOUTH

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THE enactment of a 48-hour law in Massachusetts and its threatened enactment in other New England States at a time when the cotton manufacturing industry was not able to move its production with any facility was the means of re-opening the question which had been dormant for twenty-five or more years concerning the relative advantages of cotton manufacturing in the New England States and in the South. There appears among the disputants at least two distinct groups: first, those with little or no contact with cotton manufacturing who look upon the threat of the supremacy of cotton manufacturing in the South as propaganda to influence legislation and who trace the origin of the revival of the question to the hearings on the Massachusetts 48-hour law; and second, those who are vitally anxious and who are trying to discover causes and remedies.

Increase in the South

The distribution of cotton spindles in operation in the two main cotton manufacturing centers and in scattered areas is shown by the following table from the Statistical Abstract of the United States for 1923.

In 1840, New England operated 70 per cent of the active spindles of the country; in 1880, 81 per cent; 1890, 76 per cent; 1900, 67 per cent; 1910, 54 per cent; in 1920, the percentage had fallen to 51; and in 1923, to 48, less than one-half the active spindles of the country. At the same time there is shown a persistent and rather uniform increase in the number of spindles in operation during the years up to 1923 in the New England States. The table shows the rapid increase of cotton manufacturing in the South from 1890 to 1910, but for a ten-year period, 1910–1919, the increases are not greatly different from those of New England. For the last five years, there has been a distinct curtailment of active spindles in New England which is not recorded by the graph (Fig. 2) for the cotton-growing states, since the type of goods manufactured by the southern group of states was of such a nature as to only slightly affect the increase. That the South was struggling through this period is shown by the report from South Carolina: "The year of 1924 was not a very profitable one for the cotton mills in the State. Some of the leading manufacturers have advised me that

Table I

Active Cotton Spindles
(Thousands)

Year	*The South*	*New England*	*Other States*
1880	561	8,632	1,460
1890	1,570	10,934	1,880
1900	4,368	13,171	1,933
1905	7,631	14,203	1,853
1910	10,494	15,735	2,038
1915	12,956	17,101	1,908
1916	13,382	17,474	1,950
1917	14,156	17,761	1,972
1918	14,529	17,985	2,029
1919	14,846	18,066	2,019
1920	15,231	18,287	1,963
1921	15,709	18,388	1,951
1922	15,906	17,939	1,863
1923	16,310	18,054	1,896
1924	16,944	17,066	1,839
1925	17,292	15,975	1,557

practically every mill in the State lost money in operation since last spring. Quite a number of mills were forced to shut down part of the time during the year on account of unfavorable market conditions. . . . Beginning shortly after the opening of 1924 the industry experienced an enforced program of curtailment and a period of depression which would have been disastrous indeed to the industry but for the comparatively strong position of a vast majority of our mills when the depression set in. The depression and curtailment lasted until late in the year, and it has been only during the past few weeks that normal operation of the mills has been resumed."[1]

The rapid growth of cotton manufacturing in the South is displayed further by the two graphs, Figures 4 and 5, which show the number of active spindles, Figure 4 for 1880 and Figure 5 for 1922, of five New England States, from the top down in order—Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut; and following the five southern states in order, North Carolina, South Carolina, Georgia, Alabama, and Virginia. In 1880, New England was dominantly the cotton manufacturing center, but in 1922, all the southern states in the group save Virginia had passed Maine in the number of spindles, and North Carolina and South Carolina had succeeded to second and third places respectively among the states of the United States in cotton manufacturing. The sums of the increases for the two groups of states show that the southern group has increased between 1880 and 1922 nearly 50 per cent faster than the New England group.

The percentages of increases in

FIGURE 1.—The Slater Mill, the first completely equipped cotton mill in the United States, was erected at Pawtucket, Rhode Island, in 1790, and is still standing. (Courtesy of Henry C. Dexter, Pawtucket, Rhode Island.)

[1] Sixteenth Annual Report of the Commissioner of Agriculture, Commerce and Industry of the State of South Carolina, 1924.

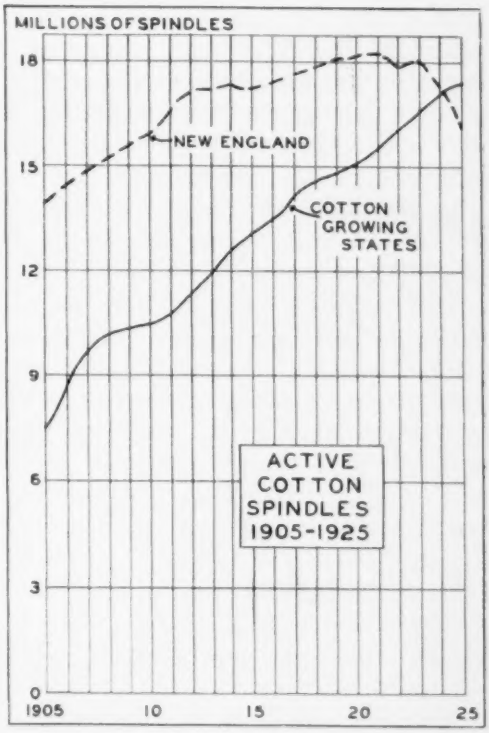

FIGURE 2.—In 1924, the number of active spindles in the cotton-growing states exceeded for the first time the number in the New England states.

active cotton spindles for the leading states in the North and the South between 1904 and 1919 is a startling bit of evidence of the great strides in manufacturing which have been taken in the cotton-growing states. This is graphically displayed in Figure 6.[2] North Carolina's increase is 145.8 per cent. The lowest gain of the southern group, Virginia, with a percentage increase of 52.6, is 60 per cent higher than the highest gain in the northern group, Massachusetts, with a percentage increase of 33.2.

FIGURE 3.—The Line Walk of the Ashaway Line and Twine Manufacturing Company, Ashaway, Rhode Island.

There are seventy counties in the United States which have more than 100,000 cotton spindles,[3] and these seventy have 83 per cent of the total number of spindles for the United States. The distribution of these counties is: 18 in North Carolina, 14 in South Carolina, 8 in Georgia, 7 in Massachusetts, 5 in Alabama, 4 in Maine, 3 each in New Hampshire and Rhode Island, 2 each in Connecticut and New York, and 1 each in Louisiana, New Jersey, Tennessee, and Virginia. The maps, Figures 8 and 9, drawn to the same scale, show the distribution of spindles within a 100-mile radius of the county in New England—Bristol, Massachusetts, with the largest number of spindles in the northern section, and of the county in the cotton-growing states, Gaston, North Carolina, with the largest number of spindles in the southern section. The sums represented on the maps are 16,467,000 spindles for the northern states and 9,077,000 for the southern. The maps show that the manufacturing of cotton is concentrated in denser groups in the North, since but thirteen counties carry the 16,467,000 spindles, whereas in the South the 9,077,000 are distributed over thirty-seven counties. The leading county in the North, and in fact in the country, Bristol, Massachusetts, has 7,702,569 cotton spindles, which is 20.8 per cent of the total for the United States. This county includes the cities of New Bedford and Fall River. Gaston County in North Carolina has 901,492 cotton spindles.

During December, 1923, for the first time, the number of active

[2] Fourteenth Census of the United States, Vol. X, Manufactures.

[3] "Cotton Production and Distribution, Season 1921–1922," Bull. 150, Dept. of Commerce, Bureau of Census, Washington, 1923, from table on page 43.

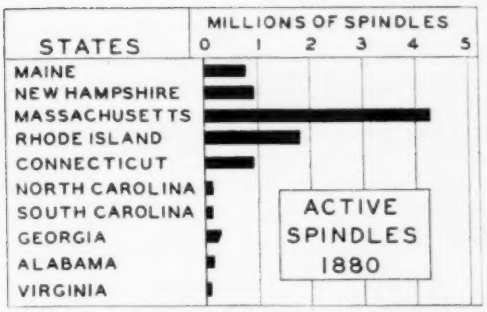

FIGURE 4.—In 1880 Southern manufacturing was almost insignificant. The threat of the Southern cotton mills was, however, disquieting to the Northern manufacturer.

spindles in the cotton-growing states excelled those in the New England States. For that month, the former had 16,346,206 and the latter, 16,080,133. The distribution of spindles in place and of active spindles is shown in Table II.

more than the other New England States, and possibly North Carolina has been more fortunate than her neighbors; nevertheless, there is a wide and impressive difference between the activities of the cotton mills in the South and in the North.

INCREASE IN SOUTH NOT DUE TO NEARNESS OF RAW MATERIALS

Although it is commonly stated[4] that the advantage of the southern cotton manufacturing is its locality in the midst of cotton fields, it is far from being the case. It may have been an advantage in the inception of the cotton industry in the cotton-growing states but, with the rapid growth of the industry in these states, the manufacturers have been obliged

TABLE II

INACTIVE SPINDLES IN NORTH AND SOUTH *

		Spindles in Place	*Spindles Active*	*Spindles Idle*	*Percentage Idle*
Massachusetts	1925	11,597,424	9,766,276	1,831,148	15.8
	1924	11,792,100	10,589,228	1,202,872	10.2
	1923	11,951,334	11,222,741	728,593	6.1
	1922	11,922,573	11,235,406	687,167	5.8
Rhode Island	1925	2,787,638	2,524,842	252,796	9.1
	1924	2,797,766	2,732,520	65,244	2.3
	1923	2,876,708	2,837,903	38,805	1.3
	1922	2,829,202	2,746,721	82,481	2.9
North Carolina	1925	5,982,076	5,909,666	72,410	1.2
	1924	5,861,366	5,763,334	98,032	1.6
	1923	5,509,183	5,563,547	45,636	.8
	1922	5,292,880	5,251,467	41,413	.8
South Carolina	1925	5,321,264	5,295,170	126,094	2.3
	1924	5,266,378	5,215,828	50,550	.9
	1923	5,132,364	5,107,038	25,326	.5
	1922	5,090,088	5,081,609	8,479	.1

* "Cotton Production and Distribution, Season 1924–1925," Bull. 158, Department of Commerce, Washington.

The condition of cotton manufacturing in the two sections of the country today is well displayed by this table. During 1925 nearly 16 per cent of the spindles in Massachusetts were inactive, and in North Carolina only a little more than one per cent. Massachusetts has suffered

[4] The Carolina Power and Light Company of North Carolina advertises, "Build a mill where the cotton grows." The Charlotte, North Carolina, Chamber of Commerce says that the territory surrounding Charlotte is destined to become the greatest industrial section of the South because, among other things, of its close proximity to sources of raw material for the manufacture of finished products from cotton, cotton yarns, etc.

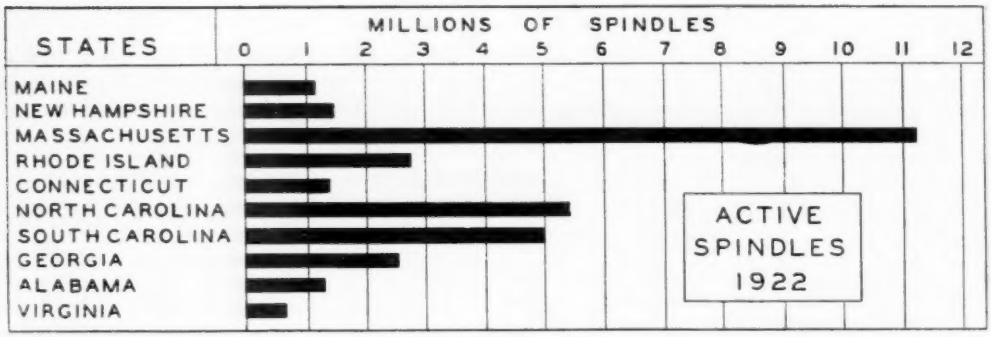

FIGURE 5.—While Massachusetts maintains her place as the premier cotton manufacturing state, the other New England states have yielded places to the cotton-growing states.

to go beyond the borders of their states for cotton. This was recognized as a tendency as early as 1912 by Copeland,[5] who says: "A saving in freight on raw materials is doubtless realized by some mills, but this economy is not so great as would at first sight appear. In North Carolina about one-fourth of the cotton used or town it may be delivered. And the freight rate from Mississippi to Charlotte, for example, is nearly as high as the rate from southern shipping points to New England."

As the number of cotton mills in the South has increased, the necessity of shipping in cotton from a distance

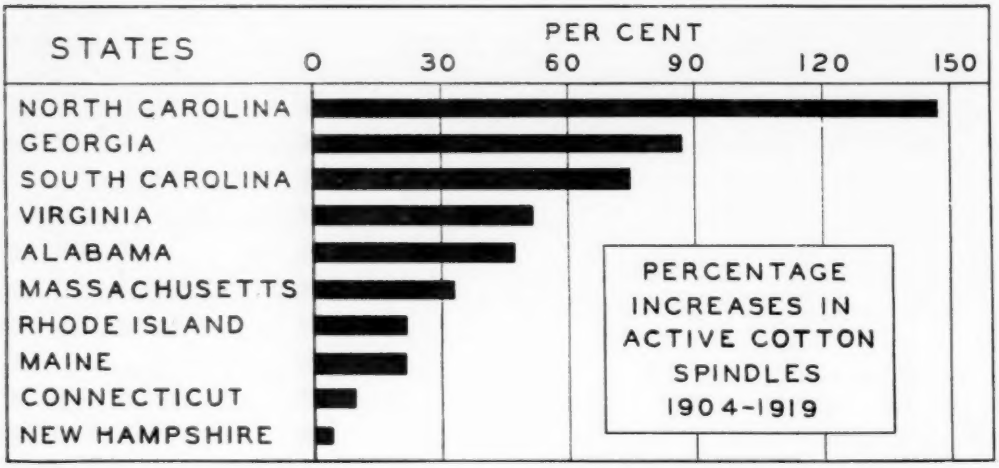

FIGURE 6.—The remarkable increases in active spindles have been among the cotton-growing states. This is not sporadic but, as the graph shows, uniformly persistent among these states.

in the mills is brought from other states, particularly Mississippi, and the price of all the cotton is determined by the Mississippi price plus the freight charge from Mississippi to Charlotte or to whatever city has been more and more pressing. In 1880, the cotton mills of South Carolina consumed 31,202 bales of cotton, which was about 6 per cent of the crop produced in the state that year; in 1924, the mills consumed 1,003,375 bales, and the production of cotton for that year in South

[5] "The Cotton Manufacturing Industry of the United States," M. T. Copeland, 1912.

Carolina was 830,900 bales.[6] It is true that many mills continue to receive cotton direct from the fields. It is likely that some of these mills save both freight and compressing charges on a part of their cotton, but the "back door cotton" is not today a very large factor in comparison with the total amount consumed. The *Providence Journal* [7] in investigating the cotton situation in 1923 emphasizes this point as follows: "Some months ago, the Chamber of Commerce of Waco, Texas, sent a committee to the Carolinas to investigate the cotton industry with a view to learning the secret of success, so that mills might be developed in and around Waco. In a spirit of sportsmanship and also of confidence, the Chamber of Commerce of Gastonia, N. C., entertained the visitors in a generous fashion. It gave them a banquet at which it presented to each visitor a set of fine, damask napkins, made in the vicinity of Gastonia from cotton that was grown at Waco, Texas. Freight rates on raw materials, in other words, do not constitute an important advantage to the present southern mills and also are not a controlling factor in the situation."

There is a further feeling, not a prophecy but a definite indication, that Texas and the Southwest are having the same feeling towards the Carolinas that the Carolinas had towards New England and that from this, there may arise another center of cotton manufacturing.

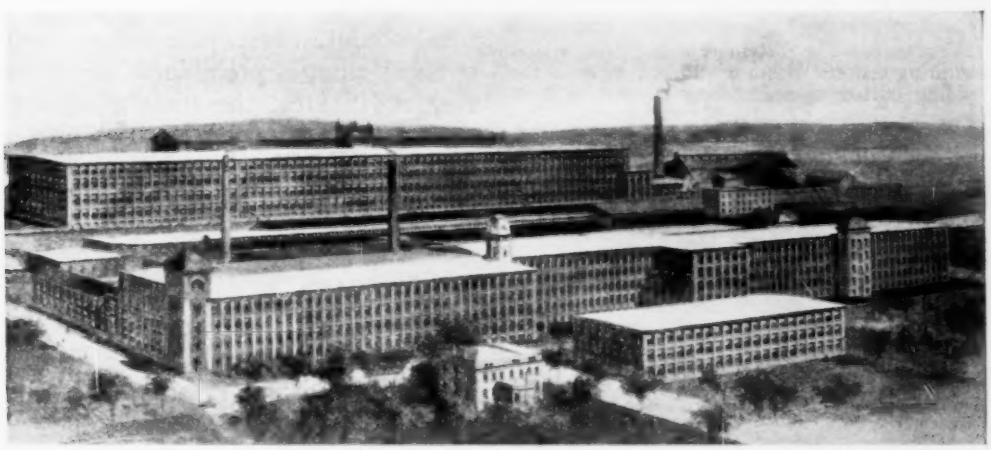

FIGURE 7.—The Mohawk Valley and Utica Cotton Mills, Utica, New York, showing the extensive plant in an urban community.

The type of goods made by the majority of southern mills consumes more cotton on the average than that of the northern mills. In 1905 the consumption of cotton in the South began to excel that in the North (Figures 12 and 13). In 1840, the cotton-growing states consumed 71,000 bales of cotton and the northern states, 166,000; by 1880, the difference had greatly increased, the former consuming 189,000 bales and the latter 1,382,000 bales; in 1905 the figures were, respectively, 2,140,000

[6] "South Carolina Agriculture and Industry," Clemson Agricultural College and State Department of Agriculture, Commerce and Industry, Columbia, S. C., 1925.

[7] Ashmun Brown, *Providence Journal*, Aug. 9, 1923, Vol. XCV, No. 193.

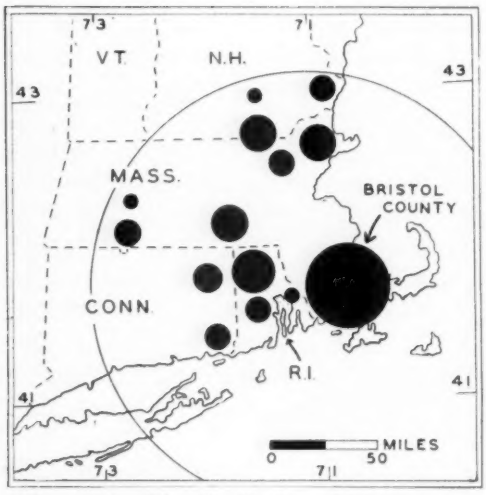

FIGURE 8.—The distribution of cotton manufacturing centers within a hundred miles of the leading cotton manufacturing county in New England, Bristol County, Massachusetts. This county holds two large cotton cities, New Bedford and Fall River.

and 2,139,000; and in 1923, 4,489,000 and 2,823,000. The consumption by states in 1922 is shown in Table III.

TABLE III

CONSUMPTION OF COTTON IN BALES

Maine	162,142	North Carolina	1,198,163
New Hampshire	175,983	South Carolina	918,725
Massachusetts	1,140,459	Georgia	781,870
Rhode Island	215,996	Alabama	377,548
Connecticut	115,631	Virginia	116,530

This demand for cotton in the southern mills, which is so much in excess of that demanded by the New England mills, results in making any advantage which at one time accrued to the southern mills because of the nearness of raw materials now of little worth.

INCREASE IN SOUTHERN MANUFACTURING PROBABLY NOT DUE TO POWER ADVANTAGES

The great emphasis on power in the cotton-growing states campaign for industry arises largely from the advertisements of power companies who are floating their stocks and bonds. While the statements they make may be well within the bounds of actuality, there has arisen from them the idea that in regard to power the cotton-growing states have a distinct advantage over the New England States.

The potential horsepower of the table is given as the maximum by the Atlas and is the horsepower that is obtainable with the flow of streams available for 50 per cent of the time, with no consideration of that obtainable through storage. While it is apparent that the larger area of the southern states gives them a larger total potential horsepower from their streams than is possible in the New England States, the smaller area of the latter allows them to draw power from areas beyond their immediate boundaries. For all purposes there has been ample power in New England, and with the advent of a Super-Power Plan, all power differences will be eradicated. New England has used three great sources of power in her mills. Originally all mills

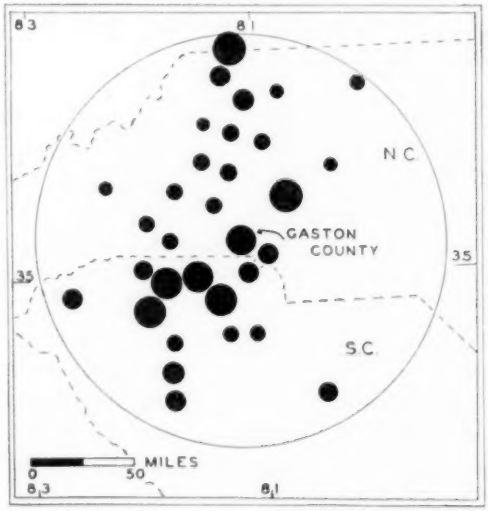

FIGURE 9.—The distribution of cotton manufacturing centers within a hundred miles of the leading cotton manufacturing county in the South, Gaston County, North Carolina. The manufacturing in the South is carried on in small centers.

TABLE IV

WATER POWER OF COTTON MANUFACTURING STATES *

State	Area Square Miles	Potential Water Power	Percentage of Whole	Percentage of Whole Installed
Maine	29,895	809,000 H.P.	1.50	4.46
New Hampshire	9,031	246,000	.32	2.41
Massachusetts	8,039	228,000	.42	3.57
Rhode Island	1,067	13,000	.02	.46
Connecticut	4,820	137,000	.26	1.69
Totals	52,852	1,433,000	2.52	12.59
North Carolina	48,740	875,000	1.62	3.94
South Carolina	30,495	677,000	1.26	4.90
Georgia	58,725	627,000	1.16	3.70
Alabama	51,279	943,000	1.74	2.81
Virginia	40,262	870,000	1.62	1.70
Totals	229,501	3,992,000	7.40	17.05

* World Atlas of Commercial Geology; Part II, "Water Power of the World," Washington, 1921.

were located at the falls in some stream. This was the day of small mills. Later the factories were enlarged when steam power was added. Now the trend is definitely towards electricity. This is illustrated by the following table showing the types of power used in Rhode Island for the years 1879 to 1919:

TABLE V

TYPES OF POWER USED IN RHODE ISLAND—UNIT, HORSEPOWER *

Year	Steam	Water	Electricity
1879	41,335	22,240	0
1889	83,528	27,197	295
1904	141,082	29,231	15,477
1914	199,170	33,649	91,224
1919	189,280	29,263	163,913

* Fourteenth Census of the United States, Rhode Island Section, Washington, 1920.

The New England States have begun definitely to turn away from coal as a source of power, and the thralldom to the whim of the miners which has been a large factor in operating costs is being overthrown. The turn to electricity places the northern and southern states on practically the same basis so far as power goes. In 1922, the five New England States used previously in comparison generated 2,752,253,000 kilowatt hours of electrical energy and sold for power 1,417,279,000 kilowatt hours; the five southern states generated 2,470,190,000 and sold for power 1,596,740,000 kilowatt hours.[8]

ADVANTAGES OF SOUTHERN COTTON MILLS

Formerly there was a great discrepancy between the northern and southern group in the practices of child labor, but at the present time no noticeable differences are apparent as may be deduced from the following table:

TABLE VI

PERCENTAGE OF TOTAL WAGE EARNERS UNDER 16 YEARS OF AGE TO THE AVERAGE NUMBER OF WAGE EARNERS *

State	1909	1914	1919
Maine	5.8	3.1	0.8
New Hampshire	2.0	0.6	1.3
Massachusetts	5.7	3.9	5.8
Rhode Island	6.0	5.6	6.0
Connecticut	4.8	4.3	4.8
North Carolina	18.9	13.3	6.0
South Carolina	18.7	15.3	6.3
Georgia	15.0	18.7	3.4
Alabama	18.7	16.7	1.8
Virginia	13.4	4.4	2.5

* Fourteenth Census of the United States; "Statistics of Manufacturing."

The requirements in child labor are changing rapidly and the data for

[8] Statistical Abstract of the United States, 1923; "The Statistics of Commercial and Municipal Plants with Current Generated and Sold," Washington, 1924.

FIGURE 10.—It is interesting to contrast this Southern cotton mill, the Brandon Mills Duck Plant, Greenville, South Carolina, with the extensive plants shown in Figures 7 and 11. (Courtesy of the *Textile World.*)

1922, which are the last available figures[9] for all sections of country, will not in all cases hold true for 1926. In the main they are today a just comparison although a constant rising of the minimum age limit is expectable.

The minimum age for children in factories and stores is 15 years in Maine, 14 years in all other states. The daily hours of labor for children in factories are as follows: Alabama, Connecticut, Virginia, and Massachusetts, 8 hours; Maine, 9 hours, South Carolina and Rhode Island, 10 hours; New Hampshire, 10¼ hours; and North Carolina, 11 hours. Children under 14 years can work only 8 hours a day. In Georgia there was no regulation, but later this became 10 hours.

The weekly hour rate for children is as follows: Massachusetts and Virginia, 44 hours; Connecticut and Alabama, 48 hours; Rhode Island, Maine, and New Hampshire, 54 hours; South Carolina, 55 hours; and North Carolina and Georgia, 60 hours.

It is shown here that the child labor agitation has reaped its harvest and more equal conditions prevail over the country than ever before. The charges that the southern manufacturer has an advantage over the northern manufacturer because of more lenient child labor laws in the cotton-growing states have no just foundation.

Limitations of working hours, however, does cause injustice, and gives one section an undue advantage whenever uniformity is absent. There was real need of a protest

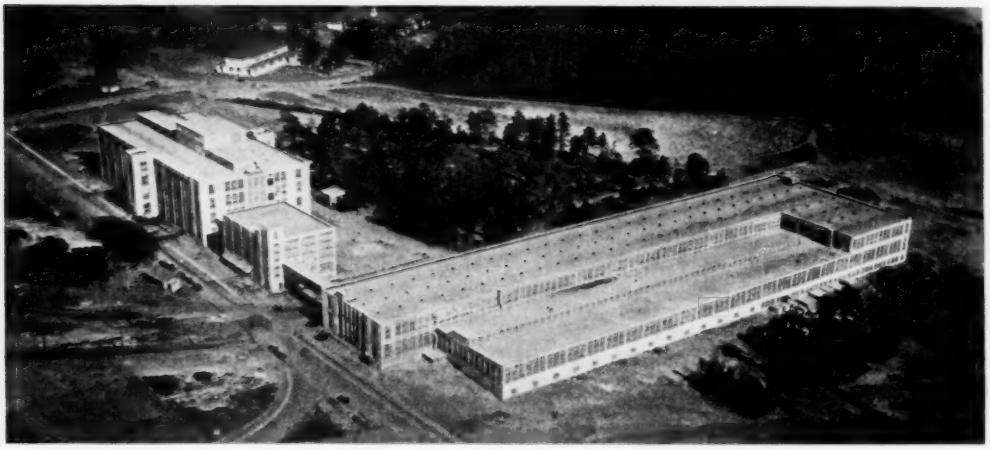

FIGURE 11.—A Southern cotton manufacturing plant at Lyman, South Carolina. (Courtesy of the *Textile World.*)

[9] "Child Labor in the United States"; United States Department of Labor, Children's Bureau, 1922.

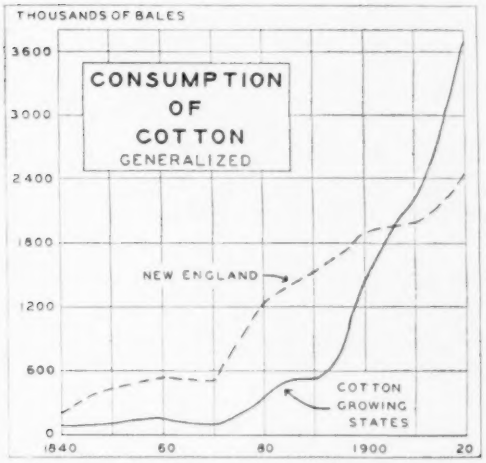

FIGURE 12.—The cotton-growing states produce a large quantity of coarse cloths which require a maximum of cotton. New England is producing a larger quantity of fine cotton materials with a minimum of cotton.

against a 48-hour law in New England so long as such a law was not to be operative in areas which were competitors in the same market. The common report was that such a law would drive the cotton industry out of New England. Over this protest Massachusetts passed it. If it is a humanitarian measure, then it is just as good for the South as it is for the North, and thereby should be as the child labor law uniformly observed. Even before the passage of this law in Massachusetts, the discrepancy in spindle hour between that state and North Carolina was large. For example, compare the two sections of the country in the following table.

The five New England States had 18,786,000 spindles in place on July 31, 1922, and the five southern states, 15,823,000; yet the New England group registered only 40,893,000,000 spindle hours to 51,971,000,000 for the southern group—three million more spindles and nine billion less spindle hours. All this difference is not due to the discrepancy in the maximum working day since there has been a cessation of work for other reasons. This, however, is about the ratio which is obtained for any month selected at random, and, whatever the reason, the southern mills gain a distinct advantage thereby over the northern.

TABLE VII

ACTIVE SPINDLE HOURS AND NUMBER OF SPINDLES IN PLACE ON JULY 31*

	Millions of Active Spindle Hours		*Spindles in Place, in 1,000*	
	1922	*1923*	*1922*	*1923*
Maine	2,631	2,830	1,146	1,141
New Hampshire	1,865	2,452	1,449	1,450
Massachusetts	23,103	25,233	11,923	11,951
Rhode Island	5,699	6,985	2,829	2,877
Connecticut	3,109	3,393	1,365	1,367
Totals	36,407	40,893	19,012	18,786
North Carolina	16,429	19,063	5,293	5,509
South Carolina	15,646	17,905	5,090	5,132
Georgia	7,374	9,318	2,679	2,694
Alabama	3,697	4,245	1,301	1,330
Virginia	1,646	1,740	1,120	1,158
Totals	44,792	51,971	15,483	15,823

* Data from Statistical Abstract of the United States, 1923.

From the tables for 1923, one can obtain the hours of operation per spindle per year. For North Carolina, this comes to 3,460, and for Massachusetts, 2,119—a difference of 1,341 hours, or about 4.5 hours per

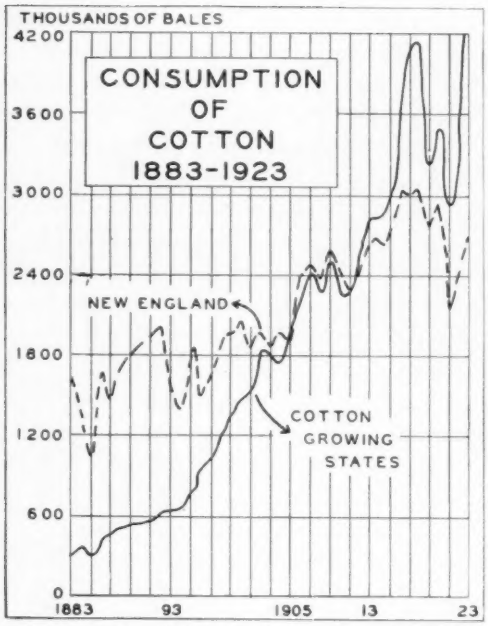

FIGURE 13.—A detail of Figure 12. Since 1905 the Southern cotton manufacturer is affected by outside conditions in the same degree as the Northern manufacturer. Before that date, the Southern growth is persistent.

working day. This obviously cannot be accounted for alone by the difference in the working day since no such difference exists; yet, whatever the cause, the South is getting from its investment a larger return than the North, and anything that acts to increase this tends to jeopardize the chances of the northern manufacturer in the open market.

Again, Rhode Island has a greater number of spindles in place than Georgia; yet the latter state shows over 2,300,000,000 more spindle hours than the former. Many comparisons of this kind may be made, but in all cases there is but one conclusion: namely the southern mill owners are getting much more from their plants per year than the northern mill owners.

Another advantage in the South is the general lower scale of wages than is possible in the North. Only two types of workers are tabulated below, but these are in general typical of the entire class of operatives in the mills.

The average wages paid per hour in

TABLE VIII

WAGES AND HOURS OF FRAME SPINNERS, MALE *

State	*Ave. Earning Per Hour*	*Ave. Full-Time Earning Per Week*	*Ave. Earning Received Per Week*	*Ave. Full-Time Hours Per Week*	*Ave. Hours Worked*
Alabama	$.174	$9.83	$8.54	56.5	49.1
North Carolina	.191	10.07	8.01	52.7	42.1
Connecticut	.372	19.72	15.61	53.0	41.9
Massachusetts	.375	20.06	17.41	53.5	46.4

* "Wages and Hours of Labor in Cotton Goods Manufacturing, 1922," U. S. Department of Labor, Bull. No. 345.

TABLE IX

WAGES AND HOURS OF WEAVERS, MALE *

State	*Ave. Earning Per Hour*	*Ave. Full-Time Earning, Two Weeks*	*Ave. Earning Received, Two Weeks*	*Ave. Full-Time Hours, Two Weeks*	*Ave. Hours Worked, Two Weeks*
Alabama	$.255	$28.46	$24.66	111.6	96.6
North Carolina	.350	38.54	31.71	110.1	90.5
Connecticut	.452	45.83	42.72	101.4	94.5
Massachusetts	.460	44.48	40.95	96.7	89.1

* See Note under Table VIII.

FIGURE 14.—The interior of a cotton mill. (Courtesy of the *Textile World*.)

the South are considerably less than in the North; Connecticut and Massachusetts pay over twice as much to frame spinners as Alabama, and 1.8 as much to weavers. Connecticut weavers worked on the average five hours less per week in 1922 than Alabama weavers and earned on the average $9.00 more.

It is well within the bounds of probability to find in these two items the longer operating time of southern mills and their lower scale of wages, the real advantage of the mills in the cotton-growing states.

A South Carolina State Report[10] is responsible for the statement that manufacturers prefer the North Carolina system of state government (specifically the meeting of the legislature every two years, and then for only 60 days, and a governor who is elected for four years and cannot succeed himself) to the Massachusetts plan, for "too much politics weigh heavily upon the cotton mill men of Massachusetts."

PROBABILITY OF EQUALIZATION

A faith in a day when there shall be an equalization of conditions between the northern and southern cotton manufacturing districts appears strong among some of the northern textile men. Others apparently not so sanguine are striving with supreme efforts to overcome the handicap placed upon them by the southern labor status.

In 1919, Massachusetts produced 82.5 per cent of the value of all tobacco, cheese, and bunting cloths produced in the United States, and in 1921 but 64.8 per cent. Tire duck cloth dropped 45.6 per cent in the same period; ounce duck, 49.1 per cent; and blankets, 19.2 per cent. Massachusetts lost ground altogether in eleven classes of goods and gained in six. Leading among those gained is shirting with silk stripe—one of the finest of cotton fabrics—and in this item the gain was from 64.5 to 82.9 per cent. The bulk of the coarser types is going South.[11]

Southern mills as well as northern have felt the pinch of the times, but the southern mills very much less

FIGURE 15.—A cotton mill interior showing the spinning frames. (Courtesy of the *Textile World*.)

since the production of the coarser types of cotton goods has not fallen off so greatly as that of the finer.

[10] Fourteenth Annual Report of the Commissioner of Agriculture, Commerce, and Industry of South Carolina, 1922.

[11] "New England Industrial Future," Orra L. Stone; published by Associated Industries of Massachusetts, October, 1924.

The more extensive manufacture of the coarser types, such as tire fabrics, belting ducks, fire hose duck, cotton ropes and twines, makes a demand for a coarser yarn, and today the average size of the yarn spun is said[12] to be ten or twelve numbers coarser than it was fifteen years ago. The result is that less spindles are required to produce the product. On the other hand, the manufacturers of fine goods in the North have been the victims of fashion and have not been able to overcome the lack of trade due to the favor for silk and rayon for wearing materials.

This leads Mr. Beede to say that there are today about 15 per cent too many spindles in the country for the type and kind of goods demanded. The market has been unfavorable to the extensive expansion of the cotton industry and relief will not be gained throughout the cotton manufacturing world until newer conditions are obtained.

The General Manager of the Associated Industries of Massachusetts[13] asserts that the South has about reached the limit of its white labor. They are in the stage that New England was during 1870–1880. The day is coming, as it came in the North, when it will be necessary to import textile labor. Then, Mr. Stone says, labor unions will begin to wax strong in that section, and laws restricting labor and regulating wages will follow. "Many northern textile men predict that in ten years there will be a leveling-up process in the South and a leveling-down process in the North that will eliminate the present advantage in favor of southern competition."

[12] H. G. Beede, *Textile World*; Vol. LXVIII, No. 24, page 30, Dec. 12, 1925.

[13] Orra L. Stone, "New England Industrial Future," October, 1924.

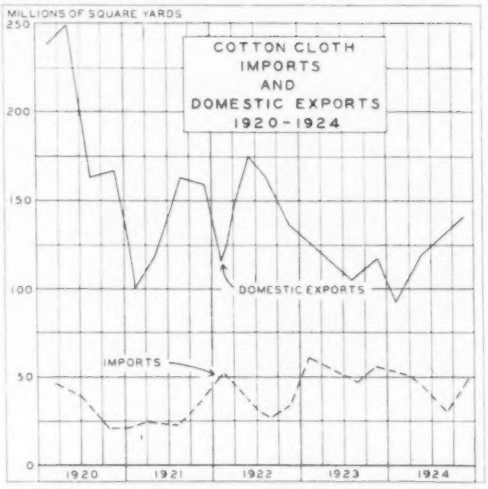

FIGURE 16.—The decrease in domestic exports and a slight tendency to increase imports has reduced the market of the home manufacturer.

That this has to some degree begun is indicated from scattered reports. Moody's Investors Service says that in many southern cotton mills the labor costs have been reduced and a cut in wages has been necessary. Following this, the newspapers announced the closing of mills in Greensboro, North Carolina, affecting 1,500 workers as a result of a dispute over a recent wage scale.

In the meantime, many of the northern cotton mills must mark time until the equalization of conditions is reached. That the stress is felt in the North more perhaps than is realized by most New Englanders may be indicated by the action[14] of the two leading cotton cities of Massachusetts.

The Board of Commerce of New Bedford has prepared a gummed sticker, which a number of mill owners are placing in the pay envelopes, advocating the use of domestic goods, to "keep our industries going."

In Fall River, an organization made up of representatives of other

[14] Orra Stone, *opus. cit.*

industries, of mill officials, and of the operatives has been formed to promote the cotton industry in that city and to stimulate the local use of products made in Fall River.

Between 1880 and 1920, the population of the United States increased 110 per cent; in the same length of time the spindles in cotton mills increased 233 per cent; the exports of cotton goods increased forty-fold; the imports of cotton goods increased five-fold; and the value of the manufactured products increased sevenfold. These are not altogether comparable terms. However, in 1920, the cotton-goods producer was better off than he was in 1925, for the exports of cotton cloth have greatly decreased since 1920 and the imports have held their own and since 1921 have increased slightly (Figure 16). A falling-off of the foreign market for cotton cloth and no or slight increases in markets in the United States for foreign mills points to but one conclusion; namely, the cost of production as the critical item. In this respect, as has been shown, the South has a great advantage. Cotton manufacturing supremacy may be maintained in the South; today, it is estimated that the South's differential over New England amounts to 30 per cent. This will gradually diminish as the years go by because of the augmentation in property values as strife for sites becomes keener; of higher wage scales as the demand becomes more pressing and population changes its character; of greater cost of raw materials as distance from the cotton fields and competition changes; and of power costs as the requirements become more exacting. "In a word, the cotton manufacturing South will lose its peculiarity. It will come to national standards, as the great seat of industry it will be responsible to the national conscience, no longer pleading on grounds of sectional patriotism, for the leniency of a costly subsidy in exploited workers."[15]

[15] Broadus Mitchell, "Southern Spindles"; *Yale Review*, XIV, No. 3, p. 508, April, 1925.

DISTRIBUTION OF CROPS IN PERU

Harley P. Milstead

Geographer, Montclair State College of Education

THE hot coastal desert, the bleak treeless plateaus and highland valleys, and the humid tropical lowland of Peru afford physical conditions conducive to a great variety of crops. Yet the amount of cultivated land remains small and the relative importance of commercial crops, compared with the rest of South America, is not great. Only 3,000,000 acres, or less than 1 per cent, of the total land area of the Republic are under actual cultivation; commercial crops constitute in value less than 6 per cent of the total of South America.

Primitive transportation facilities still persist in fully 85 per cent of the country. Only 2,018 miles of steam railroads and 100 miles of street and interurban lines were in operation in 1924. No railway net exists; most of the railways consist of short isolated lines of varying gauges connecting an ocean port with the chief towns and plantations of the adjacent irrigated valleys. In the coastal desert no longitudinal railway connects the irrigated land and no good motor roads transverse the barren stretches between the irrigated valleys. Only two systems—the Central and Southern—extend from the coast into the elevated Andean region. The Andean and *Montaña* regions still depend primarily upon the slow and primitive means of river and pack animal transportation.

Indians and Mestizos constitute 85 per cent of the population of the Republic; whites, negroes, and Asiatics make up the remainder. The majority of the population, consisting largely of full-blood Indians, resides in the elevated Andean region. The whites are found chiefly in the towns and valleys of the coastal section, although a few reside in the principal centers of the Sierra. The Mestizos, negroes, and Asiatics live on the coast and in the more developed districts of the Andes, while various tribes of wild and semi-civilized Indians constitute the major portion of the population of the eastern lowlands.

Throughout most of the Republic crude machinery and primitive methods prevail. Some effort has been made by the National School of Agriculture to improve farming conditions by practical demonstrations of machinery, by carrying on experiments, and by issuing farm bulletins. But owing to cheap labor, the high percentage of illiteracy which prevails in all sections, and their hesitancy to change from the habits of their ancestors, little progress has been made except on a few of the larger plantations.

Despite the inimical conditions of drab parched deserts, cold bleak highlands, remote tropical lowlands, poor transportation and inefficient labor, agriculture is the chief source of economic wealth in Peru.

The Coastal Desert

The Peruvian seaboard, a fringe of desert country 25 to 40 miles wide, unclad and waste, except where crossed by the many short rivers

descending from the mountains or where stretches of irrigation have made oases in the desert, is the most important crops region of Peru. Lack of area and a scarcity of water are the critical factors limiting crop development in this coastal zone.

Crop production is confined almost wholly to the deep transverse valleys —lying between the many low mountains and foothills that appear everywhere—which have been carved by the snow-fed streams and then partly filled again so that a deep alluvial

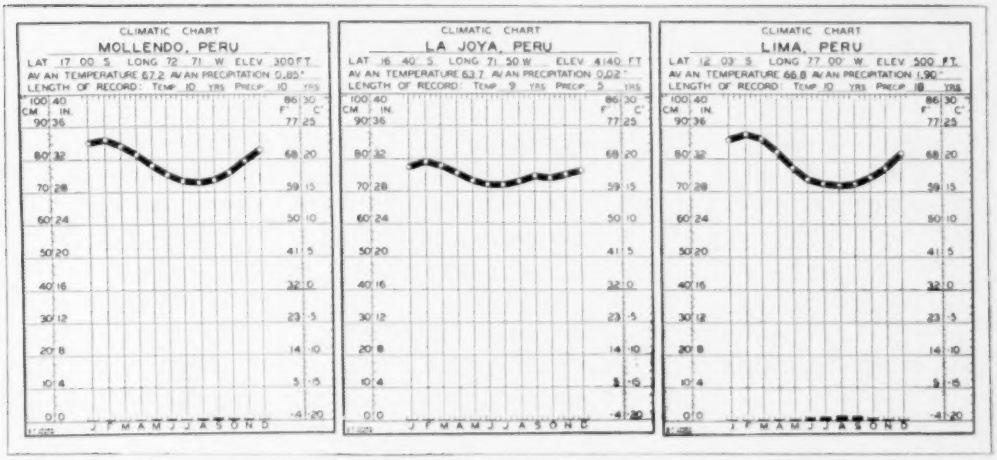

FIGURE 1.—The Coastal Desert of Peru has continuously high temperatures, large amounts of sunshine, and practically no rainfall. Trade winds, lofty mountains, ocean currents, and an upwelling of cold water along the coast are the critical factors which make this region one of the driest deserts in the world.

waste lies on their floors. A patchy arrangement of extensive flats, alluvial fans, and wide-spreading deltas is thus available for easy cultivation, and the seaward flowing streams furnish water to the irrigating canals.

The coastal region is almost a rainless desert. La Joya, a station northeast of Mollendo with an elevation of 4,140 feet, had only .02 of an inch of precipitation for a five-year period, while Mollendo on the coast at an altitude of 300 feet had only .85 of an inch for a ten-year period. At Lima eight miles inland with an elevation of 500 feet, the annual average precipitation over an eighteen-year period was 1.90 inches, most of which came in the form of heavy mists (Fig. 1). The critical relations of trade winds, lofty mountains, ocean currents, and an upwelling of cold water along the coast—caused by the steady westerly drift of the equatorial current—make the coastal zone of Peru one of the driest deserts of the world.

All crops grown in the coastal valleys must be irrigated. The many plunging mountain streams, that have been diverted onto fertile alluvial plains, bring the life-giving waters of coastal Peru. In most cases irrigation facilities consist of gravity canals, leading from fifty-two short rivers which cross the coastal desert. Since many of the streams dry up during the winter (June to November) and provision has not yet been made for impounding water for use during the dry periods, agriculture is adjusted to the stream flow of the various coastal rivers (Fig. 2).[1]

[1] The author is indebted to Clarence F. Jones of Clark University for the statistics of crop production and acreage, for the base maps, and for helpful criticisms on the organization and presentation of the "Distribution of Crops in Peru."

Following the Spanish conquest of Peru extensive land grants were made and many of the large *haciendas* of the coastal desert originating in the sixteenth and seventeenth centuries are still held intact by the rich Spaniards. The Indians were given the less desirable land; thus they produce little in the way of commercial crops except as they come from the mountains to help farm the sugar and cotton estates during the busier seasons.

Labor conditions in the coastal zone are not of the best. Cholos, the lowest strata of the mixed element, form the major portion of the unskilled laborers. As a whole they are illiterate, addicted to drunkenness, improvident, devoid of ambition, and maintain a low standard of living. Also, the strong influence of the church and labor unions are disturbing factors in the labor supply. Religious processions and numerous feast days are held at which time all forms of industry are suspended; strikes are called on the slightest provocation.

However, small as the productive area of this coastal zone is, and with its inadequate water supply, large land holdings, and poor labor conditions, it comprises one-third of all the land now under cultivation in Peru, and supplies the only important money crops of the country.

FIGURE 2.—More than 50 short rivers bring life-giving waters from the snow-capped highlands to the coastal desert valleys and give to this region a series of fertile oases which supply a variety of agricultural products.

COMMERCIAL CROPS

While the irrigated coastal lands of Peru produce a large variety of agricultural products, sugar and cotton form the great commercial crops. Rice, corn, wheat, barley, potatoes, and beans are the chief foodstuffs grown. Yet many kinds of vegetables are produced for local needs and excellent fruits of temperate and tropical varieties thrive. However, on the coast as much land as possible has been devoted to sugar and cotton, causing in recent years an actual shortage of some food crops.

Sugar

Sugar has risen from almost insignificance during the past 40 years to the leading money crop of Peru. It constitutes 26 per cent of the total exports of the country (average 1921–1923), supplies local consumption, and furnishes about 60 per cent of the alcohol made in the country. It gives steady employment on a large scale to the uneducated laborers attached to each extensive *hacienda*, offers many responsible positions to the educated class, creates a demand for foreign agricultural implements, milling machinery, and railway equipment. In fact the prosperity of the sugar industry determines the buying

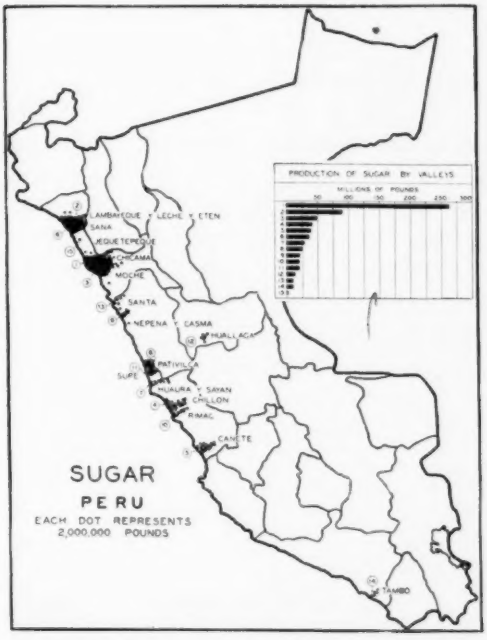

FIGURE 3.—Sugar, one of the most important commercial crops of Peru, constitutes 26 per cent of the total exports. With one exception, commercial production is confined to the irrigated coastal valleys. Three regions, (1) the Chicama and Moche section, (2) the Lima district, and (3) the Lambayeque valleys, account for about 92 per cent of the total crop of the Republic. (Statistics, four-year average, 1918, 1919, 1922, 1924; *Statistical Abstract of Peru*, 1919, 1920, 1923, 1924. Dept. of Treasury and Commerce, Lima.)

power of a considerable part of the coastal desert population.

The physical factors for the production of this commodity in the Peruvian desert are almost ideal. The friable alluvial sandy loam soils to which is added 150 to 200 pounds of Peruvian guano per acre each year, the proper application of water, the great amount of sunshine, and the continuously high temperature (Fig. 1) afford optimum conditions for a uniformly large yield of high-quality cane.

The production of cane ranges from 40 to 60 metric tons per acre, the yield depending on the fertility of the soil, amount and use of available water, and the methods employed in its cultivation. In contrast, Cuban yields of cane average about 20 metric tons, and Hawaiian 40 tons. However, the crop in Cuba is an annual, that of Hawaii a biennial, while in Peru it requires 18 to 22 months for cane to mature.

Production of sugar cane on a commercial scale in the coastal zone is confined almost entirely to 15 valleys, although a number of others produce minor amounts (Fig. 3). Three departments—Libertad, Lima, and Lambayeque—furnish 92 per cent of the total output. The Trujillo district in Libertad occupies the premier position in Peru. Here the sugar industry overshadows all other activities; the Chicama, Moche, and Viru Valleys are entirely given over to it. This district alone produces about one-half of the total crop of Peru. The plantation system of cultivation prevails; the producers have attained a high degree of scientific cultivation and mechanical proficiency comparable with methods in the leading sugar countries of the world.

Because of an irrigation system, the absence of rain, a great amount of sunshine, and uniform high temperatures, cane can be planted practically all the year around if adequate water is available, although the larger areas are planted during the flood season from November to April. Three cuttings from one planting are usually obtained, but seven or eight are common on the better lands. Cane can be cut and ground throughout the year, thus equalizing the yearly distribution of labor, necessitating less machinery, and furnishing a nearly continuous stream of sugar for the export movement (Fig. 4). Also the extensive estates have made possible

the introduction of some modern equipment for cultivation and transportation, factors which play an important rôle in the production of a money crop, for they influence vitally the quality of the product, reduce waste in grinding and lost motion in transportation.

In addition the cane districts of Peru are favored in that the cost of labor in the sugar estates amounts to only one-half the wages in Hawaii and Cuba. Of all the important cane-growing countries, only Java has a lower wage than Peru. While a general shortage of labor prevails in the coastal section the sugar industry provides steady employment throughout the year and is more favorably situated than other industries.

FIGURE 4.—The Coastal Desert of Peru affords optimum conditions for a uniformly large yield of high quality cane. Methods of cultivation and marketing are primitive—in most places—but because cane can be planted and harvested all year round there is no rush planting and harvest season to cause the neglect of either process. (Courtesy of W. A. Orton.)

Cotton

Cotton, indigenous to Peru, has made striking progress as a commercial crop during the last 25 years. With a production well under 40,000 bales in 1900, the output at present exceeds 180,000 bales. Ranking next to sugar, it constitutes 24 per cent in value (average 1921–1923) of all exports from the country, and has become one of the most dependable sources of the Republic's wealth.

Climatic factors in most of the coastal belt are exceptionally favorable for a large yield of good-quality cotton. No hail injures the growing boll, no rain discolors the ripening fiber, and no frosts injure the development of the plant. The uniformly high temperatures throughout the year (Fig. 1), and the proper application of water to the heavily fertilized earth, afford optimum conditions for the growth of this plant. Also, while the region is not free from pests and diseases, the dry atmosphere hinders development. However, planters in certain sections have recently noted a marked change in

the diurnal temperatures, a condition which favors the multiplication of pests and retards the development of the crop. Whether this phenomenon becomes permanent or is only transitory cannot be foretold, as the shifting of the cold Humboldt current near the coast is thought to have caused it.

Cotton growing is more widely distributed than the sugar production as it requires less capital. Most of the big sugar estates plant cotton, the amount varying according to the market outlook. A number of the plantations, as well as many small producers, grow cotton exclusively.

Practically the entire cotton crop comes from the irrigated coastal desert although small quantities are raised in the department of Loreto on the eastern side of the Andes. As with sugar all the land that can be possibly irrigated is given over to the production of the plant. Even the hamlets of the tradesmen, the little villages and the clustered cane-thatched, mud-walled huts of the workmen—that lie almost hidden in these valleys—are strung out along the sharply defined desert's edge at the foot of the bordering slopes (Fig. 5).

Thirty-five valleys are engaged in the production of the commercial crop, but the bulk of it grows in ten small valleys. Three fairly well-defined districts—the Piura and Chira River Valleys in the department of Piura, the central coast region from Chimbote to Ica, and the southern region—account for about 130,000 bales or 75 per cent of the total output (Fig. 6).

FIGURE 5.—Physical factors are exceptionally favorable to cotton production in this region. Cotton growing is more widely distributed than sugar production, as it requires less capital, and two or three crops are obtained from one planting. However, in some cases four or five crops may be obtained with a liberal use of fertilizer. (Courtesy of W. E. Hinds.)

As a result of the favorable climatic factors in general, Peru, even with primitive methods of cultivation, poor machinery, and inefficient labor, produces high yields of good-quality cotton. The average yield surpasses that of the United States and ranks well with the leading countries of the world. On good land it amounts to one and one-half bales per acre.

Since two or three crops can be obtained from the planting, and in

some places five with a generous use of fertilizer, a general renewal of the fields does not occur each year and planting coincides with the available water supply. The picking season is neither sharply defined nor uniform. While the peak of the harvest extends from April to July, picking takes place on one valley or another throughout the year, affording a rather uniform movement of cotton.

Several varieties of Peruvian cotton have a considerable demand in the world's markets. Full-rough (*aspero*), distinguished by its long, rough, crinkly fiber, mixes well with wool in the manufacture of textiles. *Mitafifi* with a long, creamy colored, smooth and silky fiber is especially suitable for the manufacture of automobile casings. A number of other varieties are produced, but a variety known as *Tangüis*, which has a long white fiber in both smooth and rough grades and which yields 25 to 30 per cent greater than other varieties, constitutes about 70 per cent of the total crop of the Republic.

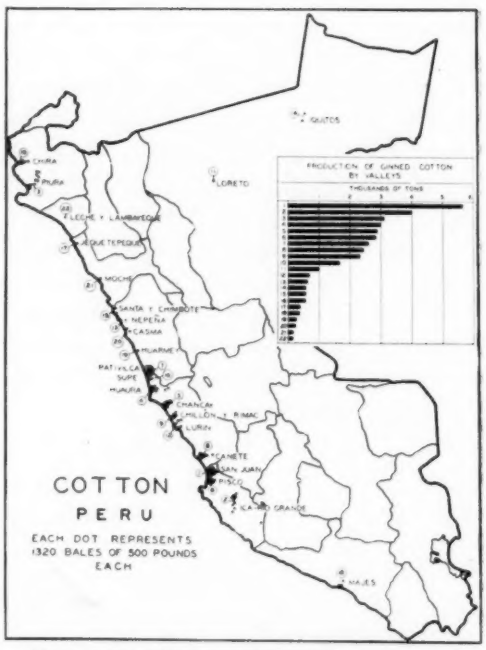

FIGURE 6.—As a commercial crop, cotton has become one of the most dependable sources of the Republic's wealth. It constitutes 24 per cent of the total exports. Practically the entire cotton crop of Peru comes from the irrigated coastal desert. Three districts, (1) the Piura and Chira River valleys, (2) the central district (Chimbote to Ica), and (3) the southern, account for about 75 per cent of the total output. Between the Santa River and the Piura River valleys cotton is largely replaced by sugar. (Statistics, four-year average, 1916–17, 1918–19, 1920–21, 1922–23; *Statistical Abstract of Peru*, 1919, 1920, 1923, 1924. Dept. of Treasury and Commerce; *Estadistica de la Produccion en la Peru*, 1920 y 1921; *Minister de Fomento*, Lima, 1924; *Foreign Crops and Markets*, Dept. of Agriculture, Washington, March 22, 1926.)

FOOD CROPS

Physical factors in the coastal desert are conducive to an extensive growth of a variety of food crops, yet some of the staple articles of diet must be imported. While grains, vegetables, and fruits enter the diet of the Peruvian, rice, corn, and beans form the staple and preferred food of the working classes.

Rice

The cultivation of rice in Peru has been developing steadily for the past decade. Many of the *haciendas* grow it, but the bulk of the crop is produced by the Asiatics and the small farmers of the Indian or Mestizo class. Thus it becomes the money crop of the poorer element.

The ease with which rice can be threshed, cleaned, and prepared for food appeals to the native who has little or no scientific knowledge of agriculture. A small amount of rice boiled for a short time is ready to eat, and combined with the nitrogenous food supplied by beans or other legumes, it makes a satisfying and nourishing meal.

Rice may be planted at any time during the season of abundant water, from November to March. The

FIGURE 7.—Rice largely replaces wheat in the diet of the natives in the coastal desert and is the chief money crop of the poorer element. The irrigated valleys of Lambayeque, Sana, Chicama, and Moche account for the bulk of the crop. (Statistics, four-year average, 1917–18, 1918–19, 1921–22, 1922–23; *Statistical Abstract of Peru*, 1919, 1920, 1923, 1924. Dept. of Treasury and Commerce.)

more progressive planters usually allow certain portions of the rice fields to remain idle every two years. The crops are produced with one flooding and little plowing. Two crops are usually harvested during the harvest season from May to August. Public mills are available for the small planter, while most of the large *haciendas* have their own. Rice milling constitutes one of the chief industries in the rice growing sections.

Two varieties, "Carolina" and "Jamaican" are grown, but the "Jamaican" finds the widest use. The average yield of about 1,800 pounds per acre equals or excels the output per acre of the United States.

Production of rice in Peru is confined largely to the coastal valleys of Lambayeque and Libertad, but some is grown to the east of the Andes in Loreto and Madre de Dios (Fig. 7). The former two departments supply about 48,000 metric tons or 75 per cent of the country. Lambayeque, occupying the leading position, accounts for nearly one-half of the total output. Considerable quantities are also raised in the coastal valleys to the south, but because of its good quality and nearness to Bolivia and Chile it goes to those countries rather than for domestic consumption. To replace the exports and to supply the excess demands over production, rice must be imported from the Orient, United States, and Brazil.

Corn

In the irrigated valleys of the coast, corn can be planted practically any time that water is available, and it matures in three or four months. Two or three crops may easily be grown in one year, which probably accounts for so much being raised in the coastal desert. Besides furnishing the natives with a considerable part of their food supply, large quantities of the crop are used for making "chicha," the most common beverage of the lower classes.

Legumes

Though a variety of legumes are grown in the coastal desert of Peru, beans are the most important. Produced over a wide area and grown under a variety of names, they constitute an important part of the food of the people. The many different varieties of field beans, black, brown, and others, are generally known by their particular name in trade. Broad or horse beans, which thrive in all parts of the country, are the chief variety produced.

Grown only for local needs, they are chiefly an intertilled crop, thus needing little cultivation. They can be harvested easily, possess good keeping qualities, and like rice require little effort in their preparation for eating. They can be planted almost any time in the irrigated coastal desert, and two or three crops may be gathered annually.

Peas grow extensively in certain sections, as do lentils, lima beans, chick peas, peanuts, and many garden vegetables. As late as 1917 various legumes were exported, but during the past few years the output has barely supplied local consumption.

Fruit

With the large amounts of sunshine, the continuously high temperatures, there are no better fruit lands anywhere than the irrigated valleys of the coastal desert of Peru. Bananas, oranges, lemons, and limes grow side by side with peaches and pears, delicious cherries, plums, dates, and figs. There are olives, grapes, watermelons and muskmelons, *guavas*, and also pawpaws and alligator pears.

The vine and the olive have received greatest attention, yet are only of local importance. Oranges of excellent grade grow in many places; limes and lemons, while widely distributed, are usually of inferior quality; the bananas are small and in many cases insipid. Fruit can be found for sale at very reasonable prices in almost every town and railway station along the coast. However, before the fruit industry can be developed for the export market, there must be great improvement in transportation facilities.

MISCELLANEOUS CROPS

Among the miscellaneous crops of the coastal desert may be mentioned tobacco, coffee, wheat, barley, and alfalfa. None of them are of any particular significance except in small local communities.

The cultivation of tobacco in Peru is subject to the control of the Tobacco Monopoly (*Estanco del Tabaco*); zones were established where planters may grow the tobacco, and all grown must be sold to this monopoly. For this reason and because of the great variations in quality and grades of Peruvian tobacco, owing to the more or less primitive methods employed in growing, there has been little or no attempt to encourage its growth. In fact many sections which formerly produced considerable quantities have practically abandoned the industry.

Peru produces practically all of the coffee consumed in the Republic. A number of coastal valleys produce it for local needs but the major portion comes from the highlands and the deep valleys to the east of the Andes.

Wheat has been replaced by rice in the coastal desert; barley grows chiefly in the highlands but in a few places is grown for forage crop. Alfalfa, much better for forage than barley, grows in many of the irrigated valleys and is widely used for animal feed.

THE ANDEAN MOUNTAIN AND PLATEAU ZONE

In contrast to the commercial agriculture of the coastal desert, that of the Sierra consists primarily of the production of food crops for the backward Indian population. It is intimately related to the climate, soil, and relief of the deep isolated basins

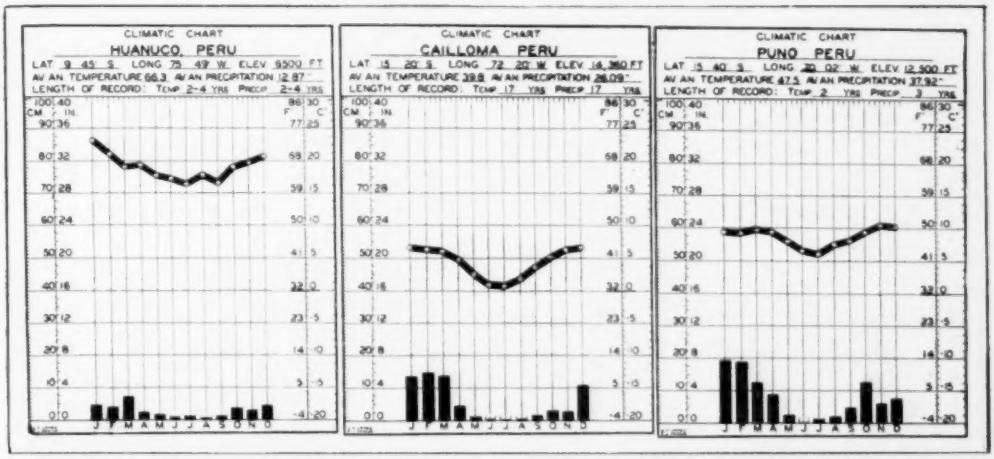

FIGURE 8.—The annual average temperature, as well as the annual average precipitation in the Sierra, varies with altitude. The seasonal ranges of temperature are not great, but variation between day and night is sharply marked. The rainy season extends from October to April, and experiences temperatures 4° to 12° F. higher than the dry season which lasts during the remaining months.

and valleys, the broad bleak tablelands, and the towering snow-crowned peaks.

Nowhere else on earth are greater physical contrasts compressed within such small spaces. The differences of altitude and lack of arable area become the critical factors to which adjustments must be made. Within the limits of a few thousand feet there is a distinct change from torrid to frigid zone, and from arid to semiarid conditions in the deep enclosed valleys to a zone of annual rainfall of more than 30 inches in the highlands.

In general, the seasonal ranges of temperature on the Sierra are not great, but the variation between day and night is sharply marked. The annual average varies with altitude from less than 40° F. at about 14,360 feet, to more than 66° F. at 6,500 feet. Seasons in the Sierra are determined more by the rainfall than by temperatures. The rainy season or winter extends from October to April and experiences temperatures 4° to 12° F. higher than the dry season or summer which lasts during the remaining months. The average annual precipitation varies with altitude, ranging from about 13 inches at 6,500 feet to more than 35 inches at 12,500 feet, but drops to 25 inches at 14,350 feet (Fig. 8). Comparatively little snow falls below 14,000 feet and the snow line ranges from 15,000 to 17,000 feet.

Owing to the paucity of arable land and because most of the population are farmers if left to their own occupation, almost every square foot of farming land has been appropriated for cultivation, from the small fertile alluvial fans and wide flats in the large valleys, to the gentle slopes that hang between the rough mountain slopes above and steep canyon walls below. Three- and four-story farms have been developed with the products ranging from tropical and subtropical crops on the lowlands to products of middle or high latitudes on the highlands (Fig. 9).

Corresponding to the superimposed strata of climate, arable land, and crops, is the vertical stratification of Sierra society. In the valleys at altitudes from 7,000 to 11,000 feet lie the towns and villages, the social

centers of these sparsely populated regions. The inhabitants, chiefly agriculturists, calmly pursue a tranquil and uneventful existence. Just within the rim of the high canyon walls—for protection from the cold, dry plateau winds—stand the desolate, thatched stone huts of the shepherds. Though only a half day's journey from these bare breathless heights to the warm canyon floor below, the press of farm population has held them back for centuries on this fringe of culture where the only new elements that enter their lives come in by way of a process of ethnic seepage.

FIGURE 9.—To the wayfarer from the cold bleak highlands the cultivated fields on the warm green valley floors look like sunken gardens and seem the climax of scenic beauty. In some places the whole floor is cultivated from one valley wall to another, while in other places the fields are restricted to narrow bands between the river and adjacent cliffs of a narrow canyon. (Courtesy of C. F. Jones.)

Where the agricultural products are grown, crude implements and primitive methods are employed; the soil is broken by a pointed wooden stick used as a spade or plow and drawn by either man or beast. Crops, planted, cultivated and harvested by hand, are carried from the fields by Indians or burrows, threshed with flails or by the treading of animals on earthen or stone floors, and winnowed by the breezes.

Primitive transportation facilities still persist throughout the Sierra region. Roads consist of narrow winding trails leading from one isolated district to another; many of them have steep grades, overhang precipices, and during the rainy season become so slippery and dangerous that travel must be suspended.

Although about three-fourths of the population of the country reside in the highlands, labor is neither plentiful nor efficient; the Indian has little ambition and few desires. He wants only a bare living and physical pleasures; high wages or surplus crop products do not induce harder work, but rather less. Thus the highland Indian of Peru constitutes a negative factor in commercial crop production, for he produces little if anything that enters into world trade.

A number of food crops ranging from tropical and temperate varieties to the hardiest grains are generally grown in many of the settlements of the Sierra. However, such products as oranges and bananas, cane sugar, and other subtropical crops are produced only in valleys lying at an elevation less than 8,000 feet, and are of minor significance as a source of food in the Andean region. The average mountain community produces two classes of crops, grains and root crops (Fig. 10).

FIGURE 10.—Vegetables of many varieties are grown throughout Peru. They are found for sale at reasonable prices in most every town and railway station. A market in Oroya. (Courtesy of C. F. Jones.)

GRAIN CROPS

Though corn, wheat, barley, and *quinua* are grown throughout the Sierra, corn constitutes a larger proportion of the food of the lower classes than any other single crop.

Corn

Corn comprises one of the mainstays of the mountain country. Both man and beast derive their nourishment to a surprising degree from the grain; the stalks are used for fodder. While parched corn is much eaten, corn made into bread becomes most useful where white bread cannot be had, and is often preferred; also quantities of it are used in the manufacture of "chicha," the most popular drink of the lower class.

Indigenous to Peru, and owing to the ability of corn to grow on very rough land, where other grains will not do so well or yield so much, it grows in every part of the country to an altitude of 11,000 feet; however, it does not do well above 8,000 feet. Yields are extremely variable on account of the great variety of growing conditions.

The bulk of the production comes from the numerous mountain valleys where it is often grown under irrigation. In some of these districts corn has been grown continuously on the same soil since the earliest remembrance of the inhabitants. While complete statistics of production are not available, the total probably exceeds 5,000,000 bushels, about three-fifths of which comes from the three departments of Cajamarca, Ancash, and Cuzco (Fig. 11).

Wheat

Wheat, grown almost entirely in the highlands at all altitudes up to 13,000 feet, and under extremely variable conditions, has been one of

FIGURE 11.—Corn comprises one of the mainstays of the mountain country. Both man and beast rely upon it for their nourishment to a surprising degree. It grows in every part of the country up to an altitude of 11,000 feet, but the major portion of the crop comes from the irrigated mountain valleys.

the staple food crops of the highland Indians since the middle of the sixteenth century (1535). Almost the entire crop is consumed locally, but the present production of 2,700,000 bushels supplies only about one-half of the annual requirements.

In some sections wheat grows as a winter crop while in others as a summer crop. Regions with considerable rainfall account for the bulk of the production, although some is grown under irrigation. In the majority of the provinces the planting season ranges from October to December, but it may be from March to May. The most general harvest period is from June to August during the dry season.

Methods of cultivation are as primitive as they were several centuries ago; a harvest scene recalls the days of ancient biblical times (Fig. 12). The yield per acre varies greatly for different years and for different sections. The production varies from 9 to 13 bushels per acre with an average of about 11 bushels per acre as compared with 13½ for the United States (1926).

The chief regions of wheat production are in the high mountain valleys near centers of population, the most important of which lies in the wide Mantaro River Valley at an elevation of about 11,000 feet. This section alone accounts for about 30 per cent of the total output of the country (Fig. 13).

From this region only, which is served by the Central Railway of Peru, shipments of wheat are sent to Lima on the coast. Because of the cost of transportation it is cheaper to import wheat from foreign countries than to attempt to utilize the domestic crop grown in the highly remote and isolated sections of the Andean region.

Barley

Barley, the hardiest of the important cereals, grows throughout the Andean region of Peru, and forms one of the important food crops of the highland Indians. Possessing a wide climatic range, it grows well from the warm valleys to all altitudes up to 14,000 feet. Essentially a highland crop in Peru, it replaces wheat at high elevations.

Though data of production are meager, the annual average output no doubt greatly exceeds 2,000,000 bushels, with the bulk of the crops coming from the highlands of Cajamarca, Ancash, and Cuzco. Some years there is a small surplus while in other years small amounts must be imported (Fig. 14).

FIGURE 12.—Threshing grain near Huancayo, Peru. Methods of cultivation are as primitive as they were several centuries ago; a harvest scene recalls the days of ancient biblical times. Crops, planted, cultivated, and harvested by hand, are threshed with flails or by the treading of animals on earthen or stone floors and winnowed by the breezes. (Courtesy of Albert H. Kampe, Huancayo Magnetic Observatory, Peru.)

In the appearance of the growing plant and of the seed, it bears close resemblance to wheat, but under similar cultural conditions the yield per acre is much greater. Owing to the greater yields and its ability to withstand cold and drought, barley forms an important source of food to man and beast in these cold, windswept highlands.

Quinua

Quinua, a small-grained cereal which grows at altitudes where barley will not ripen (above 14,000 feet), takes the place of other grains in the highest altitudes.

Indigenous to South America, it has been grown by the Indians for hundreds of years. It thrives well in poor soils, is exceedingly prolific, and though never planted in large areas, its distribution is fairly general in the highlands. The total annual production probably amounts to 2,000,000 pounds or more. Cajamarca alone produces 750,000 pounds (Fig. 15).

In the appearance of the growing plant, *quinua* (Chenopodium quinoa) bears close resemblance to the dockweed. It has yellow or red leaves; its seeds are white and about the size of mustard seed. It may be eaten raw with sugar or water, cooked as a mush or used in stews, and forms a palatable and nutritious article of food for the highland Indians.

ROOT CROPS

Root crops in highland Peru consist of potatoes, *oca*, *olluco*, and *yuca*. While all are important, the potato ranks next to corn as a food and is the leading root crop produced in the Andean zone.

Potatoes

Potatoes, native to Peru, have constituted an important part of the diet of the people for thousands of years. Although not as nutritious

FIGURE 13.—Wheat has been one of the staple food crops of the highland Indians since the middle of the sixteenth century. Most of it is raised in the high mountain valleys near centers of population. (Statistics, five-year average, 1918–19, 1921–23; *Statistical Abstract of Peru*, 1919, 1920, 1923, 1924. Dept. of Treasury and Commerce; for 1921, *Estadistica de la Producçion de Trigo en el Peru*, 1921 y 1922, Ministerio de Fomento, Lima, 1924.)

as grain they endure the rigorous conditions of the region, usually have a higher yield per acre and supply the starch food (Carbohydrates) so necessary to life in this cold highland region. In fact a failure in the potato crop leads to great suffering among the poorer class Indians.

The potato has a wide climatic range and tolerates a variety of soils. It grows in all parts of highland Peru to an altitude of 14,000 feet. Nowhere else in the world has the potato been produced under such severe climatic conditions as in its native lands of Peru and Bolivia. It will endure some frost and grow where most cultivated plants cannot thrive.

Primitive methods of production prevail: the ground is broken by a steel shod stick; the seed potato is dropped into a mere puncture; and it receives no attention thereafter until harvest time.

Potatoes are of many sizes and colors. They may be as large as a squash or as small as a marble, and in color may be black, red, or yellow. The thriftiest varieties are hard and bitter, but are edible. A considerable portion of the Andean crop is used in the form of *Chuno* made by the alternate freezing and thawing of the potatoes (which are first soaked in water) until they become soft, when the skins are tramped off by the bare feet of the natives. Dried in this form the potatoes will keep almost indefinitely, and for use are cooked into a soup or stew.

The total crop of Peru probably amounts to 10,000,000 bushels or more, one-half of which comes from the

FIGURE 14.—Possessing a wide climatic range barley grows at all altitudes up to 14,000 feet. It is especially important as a food supply for the highland Indian and is produced in nearly all parts of the Republic.

FIGURE 15.—Quinua grows at all altitudes, but is of especial importance to the highland Indians because it will ripen in low temperatures where other cereals will not.

highlands of Ancash and Cajamarca (Fig. 16). With careful cultivation, no doubt the annual production could be doubled.

Oca and Olluco

High up in the mountains where ordinary potatoes will not grow, they are replaced by two other tubers, *oca* and *olluco*. These plants will produce well, even above 14,000 feet and at low temperatures.

About 35,000,000 pounds of *oca* and 20,000,000 pounds of *olluco* were produced in 1918. With complete data available the production would no doubt have doubled these amounts.

Even though produced in small quantities and only at high altitudes, *oca* and *olluco* are extremely important food crops. They supply the starch foods, which are so necessary in these cold, bleak heights, to make fat and heat to keep the body warm, and to give energy for work.

Yuca

Yuca (*Cassava*) grown throughout most of Peru is an important food crop in the Andes. It thrives best on light, sandy soils of the warm valleys and largely replaces, in these localities, the potato and corn. The plant reaches a height of 8 or 10 feet, develops roots from 1 to 3 inches thick, and from 1 to 3 feet long.

In Peru a sauce and an intoxicating beverage are prepared from the juice, and the roots powdered and made into cakes. These cakes are a standard article of diet and the bread of the natives in many localities.

MONTAÑA

While the chief crops of the coastal desert supply fully one-half of the total exports of the country, and the many agricultural products of the Andean Mountain and Plateau zone furnish the food for considerably more than half the Indian and Mestizo population, the agriculture of eastern Peru plays an insignificant rôle in the life of the country in spite of the fact that extensive areas in that region favor the growth of a variety of crops.

This region, comprising about one-half of Peru, embraces the slopes of the Eastern Cordillera below 5,000 feet and the eastern forest country. The western limits are irregular and not sharply defined. This broken country, with its rolling hills, mountain spurs, and fertile valleys in relief, is not unlike parts of the Appalachian region of the United States.

The *Montaña* is a true frontier region. Largely unsettled, in part unexplored, except along and near the

courses of its navigable streams, it is covered with dense tropical forests of fine woods and rubber trees, tangled vines, and an undergrowth of rank vegetation rich in many useful plants.

At present, the *Montaña* is sparsely inhabited by many tribes of uncivilized Indians, a sprinkling of Spanish and hybrids in a few scattered and isolated villages. The density of population is much less than one per square mile. Most of the people live in small groups of a dozen to twenty, each in villages along the river banks or in small concealed clearings accessible by trails known only to the Indians.

At best their life is primitive. Their food consists chiefly of *yuca*, sugar cane, corn, bananas and other fruit, and fish. A single cotton shirt completes the raiment of the married men and women, while the girls and boys in many cases go entirely naked except for a loin cloth, a necklace of nuts or monkey teeth. A thatched cane hut shelters them from heavy rains, and a grass hammock is their bed.

Transportation facilities are inadequate. To the west of the *Montaña* rises the great Andean mountain and plateau barrier, and to the east the hot forested Amazonian plains stretch for more than 2,000 miles. No roads yet exist, only a few private paths to the adjacent streams are kept open by individual rubber gatherers, and a few boggy muddy trails or portages, which are scarcely passable for mules, lead from one river system to another. In fact, all of the region must depend on the slow, sluggish, tropical streams or the equally slow and primitive means of pack animals for transportation.

Even though whites were eager to develop the region, they would be halted on account of the scarcity of labor, for no laborers are available far from the edge of the Andean region. To the nature-life of the Indian money has no charm or meaning except as it can be used for an ornament, and when his love for an ornament has been satisfied, he ceases to work. Even though his food, clothing, and shelter are of the most primitive kind, they are the best in the world to him because they are the only kind he has known. Here money and finery fail, for his greatest luxury is leisure.

Thus, even though the region contains vast areas of land suitable for agriculture, only an insignificant portion has been placed under cultivation.

On the sand bars, and along the rivers where limited clearings have

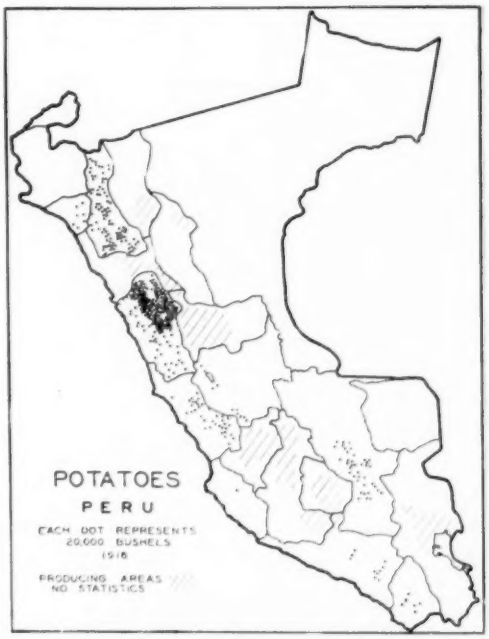

FIGURE 16.—Indigenous to Peru the potato has a wide climatic range and tolerates a variety of soils. The potato grows in all parts of highland Peru up to 14,000 feet. It is the critical factor in the food supply of the native. A failure of the potato crop leads to great suffering among the natives.

been made, tiny patches of *yuca*, cane, corn, and vegetables are cultivated by the natives in a most primitive manner with the crudest of implements. In fact little agriculture is carried on in a systematic way or along scientific lines. A few *haciendas* have been developed on the exceedingly fertile eastern slopes of the Andes, and mountain valleys where crops of coca, coffee, cacao, tobacco, corn, fruits, and vegetables are produced.

With the exception of coca and cotton all crops grown are consumed locally. Coca thrives best at an altitude 2,000 feet to 5,000 feet and the bulk of the Peruvian crop comes from the terraced slopes along the eastern Andes which lie at about this elevation. The total production probably reaches thousands of tons yearly, although no definite figures are available. While the region furnishes nearly all the world's cocaine, most of the crop is carried by human porters, or by asses and llamas to the highland Indians who chew the leaves almost constantly, deriving from them powers of endurance and resistance to hunger and cold.

Since the depression in the rubber industry, cotton has been turned to as a possible substitute source of income. However, the dearth of population, crude methods of agriculture, inadequate transportation facilities, lack of grading and standardization restrict the total production to small amounts. Between 4,000 and 5,000 bales are exported annually from this region most of which goes to Liverpool.

TRENDS AND POSSIBILITIES

Crop development in Peru has made striking progress during the present century. Peru has supplied crops in such increasing quantities to the world market until at the present time two agricultural commodities, sugar and cotton, furnish in value fully 50 per cent of the total exports of the country. These staple commodities will be needed in even greater quantities as the world moves forward and no limits can be placed upon the rate or proportion of the Republic's growth providing it can supply these articles in the future as it has during the past two decades. That Peru can continue to supply these at the same rate of growth as during the past is questioned.

The cotton and sugar industries in the coastal desert can never become great enough to disturb world markets. An extension of the acreage depends chiefly upon the development of irrigation facilities on the coast; the foremost authorities on irrigation agree that the output of commercial crops of sugar and cotton in the coastal desert cannot be increased more than 20 to 25 per cent, by the construction of new irrigation works, better methods of cultivation, grading and marketing.

The mountain and plateau region has never supplied commercial crops in appreciable amounts. An occasional surplus may occur in some parts and be carried to the coast or to an adjacent region, but rarely does a highland crop find its way into the commercial marts of the world. Crop production might be greatly increased by scientific farming, even though the amount of arable land is restricted, but white men will not endure the hardships of the Andes, and the Indians are so isolated and far removed from civilization that they persist in a primitive way. Furthermore crops exported from the highlands will not bear the cost of

transportation and pay a fair return to the producer. Thus it seems certain that the Andean mountains and plateaus have erected a topographic and climatic barrier which may forever keep the highland region in a state of agricultural stagnation.

The potential productivity of the *Montaña* unquestionably is great. Yet any conquest of these lands, which produces a surplus of crops beyond the needs of the local population, must seek distant markets. The cost of exporting products over the spreading ranges and plateaus of the Andes to the Pacific or by way of the rivers 2,000 miles or more to the Atlantic would be so great that most of them would not pay the cost of transportation and guarantee the farmer of the *Montaña* anything for his labor. Also, the intense tropical heat, excessive rainfall and high humidity during most of the year, the dense forests, the intolerable insects and prevalence of diseases, and extreme isolation offers little or no attraction for settlers even from the most crowded corners of the earth. Thus, the development of the *Montaña* must be relegated to the distant future until the press of population becomes unbearable in more attractive parts of the world.

BOOK REVIEWS

DEPARTMENT OF COMMERCE

Bureau of Foreign and Domestic Commerce

Commerce Yearbook of the United States for 1926, Volume I.

An extremely valuable survey of commerce and industry for the United States, including a text and detailed statistics. Price, $1.00.

The Philippine Islands. By O. M. Butler. Trade Promotion Series No. 52. Price, 20 cents.

This handbook contains a detailed description of the Islands and a history of their development. The great natural resources of the Philippine Islands, which have made possible an almost phenomenal commercial development within the last twenty years, are treated at length. These Islands have become an important source of raw materials essential to the industrial growth of the western world. Approximately one-third of the United States total purchases abroad in 1926 consisted of four products—crude rubber, raw silk, coffee, and sugar. Sugar ranks first in value among Philippine exports and the total output of the centrifugal production is shipped to the United States. Production of raw silk in the Island has so far been limited to experiments, but both rubber and coffee are now being profitably cultivated though in negligible quantities. Other raw materials necessary for American industry are produced in the Philippines. Mr. Butler pictures both the present and the potential development of the Islands. Maps and illustrations accompany the text.

The Anglo-Egyptian Sudan. By North Winship. Trade Promotion Series No. 49. Price, 15 cents.

The important economic development which has occurred within the Anglo-Egyptian Sudan within the last twenty years makes this discussion of the area especially opportune, for little has as yet been published about it. During this period the export trade of the region has increased enormously, while railroads, river steamboats, modern irrigation, and hydro-electric power have been introduced into the country. From a little-known and almost unproductive area, a dangerous caravan-route from Central Africa to the Red Sea, the region now known as the Sudan has been developed under condominium of the British and Egyptian Governments, into a state with such stable administration and economic organization that it promises to become one of the world's most important new markets. The Sudan is already one of the world's best sources of such products as gum-arabic, sesame, and senna, and rapidly is becoming an important producing center for cotton, vegetable ivory, and millet. Maps and illustrations are included in the Handbook.

Hides and Skins. World Production and International Trade. By J. Schnitzer. Trade Promotion Series No. 50. Price, 35 cents.

In view of the active interest in the world production and conservation of hides, skins, and livestock, this bulletin furnishes some much needed valuable information. It presents a world survey of conditions by continents.

Monthly Summary of Foreign Commerce of the United States. Annual subscription, $1.25. Single copies, Part I, 10 cents; Part II, 5 cents.

These detailed statistics of foreign trade are published monthly and present current trade movements. The June and December issues each contain summary statements for the preceding twelve months.

Markets for Prepared Medicines. By M. C. Bergin. Trade Promotion Series No. 48. Price, 10 cents.

This discussion of the foreign markets for American-prepared medicines contains much worthwhile geographic and economic information.

Packing for Domestic Shipment.

A series, published by the Domestic Commerce Division, contains information of interest to those specializing in trade.

Petroleum Refineries in Foreign Countries. By John H. Nelson. Trade Information Bulletin No. 494. Price, 10 cents.

The increasing number of foreign sources of crude oil, consideration of national economies, and the efficient utilization of petroleum have contributed to the establishment of petroleum refineries in many foreign countries, among which may be mentioned England, Persia, the Netherland East Indies, and Rumania. This development of petroleum refining abroad is of intimate concern to the commercial industry, since exports of petroleum products rank second in value among all United States exports. Furthermore, American crude oil exported for refining abroad has been in a measure displaced by oil originating in Persia, Mexico, Russia, Rumania, and now coming in constantly increased amounts from South American fields. An important consideration in this development of petroleum refining in foreign countries is the potential market offered for factory equipment which embraces many lines of American manufacture.

Foreign Markets for Tractors. By Charles D. Martin. Trade Information Bulletin No. 502. Price, 10 cents.

American tractors in recent years have gone to foreign countries in increased numbers. This bulletin is in one sense a summary of the survey of world markets for tractors. Exports of these machines to foreign countries have increased uninterruptedly during the past five years, and in 1926 more than 50,000 American tractors were shipped to foreign countries with a total value, including parts, of $36,000,000. The summary of conditions prevailing throughout the world as regards the markets and demand for tractors contains much of geographic interest.

Factors in Wheat Marketing. By Theodore D. Hammatt.

A brief, but pointed discussion, well illustrated by graphs of factors relating to the world wheat market.

Parana Pine Lumber Industry of Brazil. By Joseph C. Kircher. Trade Information Bulletin No. 493. Price, 10 cents.

Parana Pine competes with Southern Pine from the United States in Brazil and the River Plate countries. This important Brazilian industry is discussed in detail.

COAST AND GEODETIC SURVEY

Geodetic Operations in the United States, January 1, 1924 to December 31, 1926. By William Bowie. Special Publication No. 134.

This survey of geodetic operations in the United States is the text of a report to the Section of Geodesy of the International Geodetic and Geophysical Union, International Research Council. Maps are of prime interest to the geographer, and he is in need of the most accurate obtainable. These can be made only when accurate triangulation has been carried on in sufficient detail. This report by Dr. Bowie presents by means of text, statistics, and maps, the status of geodetic operations within the United States.

Catalogue of Charts, Coast Pilots, Tide Tables and Current Tables of the Philippine Islands, August 1. 1927.

A complete list for geographers interested in the Philippines.

Tide Tables of the United States and Foreign Ports for 1928. Price, 75 cents.

United States Coast Pilot, Atlantic Coast, Section A, St. Croix River to Cape Cod.

A detailed description of this coast.

Seismological Report, January, February, March, 1926. Serial Number 395. By Frank Neumann and Jerry H. Service. Price, 10 cents.

A complete report of earthquakes for this period.

BUREAU OF MINES

Mineral Resources of the United States in 1926. (Preliminary Summary.) Price, 20 cents.

A rather detailed statistical summary of mineral production for this period.

BUREAU OF FISHERIES

Report of the United States Commissioner of Fisheries. For the Fiscal Year 1926 with Appendixes.

This comprehensive report contains much material of interest.

Investigations Concerning the Red-Salmon Runs to the Karluk River, Alaska. By Charles H. Gilbert and Willis H. Rich. Bureau of Fisheries Document No. 1021. Price, 25 cents.

Preparation of Fish for Canning as Sardines. By Harry R. Beard. Bureau of Fisheries Document No. 1020. Price, 30 cents.

Salmon-Tagging Experiments in Alaska, 1926. By Willis H. Rich and Arnie J. Suomela. Bureau of Fisheries Document No. 1022. Price, 10 cents.

Alaska Fishery and Fur-Seal Industries in 1926. By Ward T. Bower. Bureau of Fisheries Document No. 1023. Price, 20 cents.

BUREAU OF THE CENSUS

Census of Manufactures and of Agriculture, 1925. Summary of Statistics by States.

Census of manufactures available for various commodities. These 1925 statistics for agriculture and manufactures provide current facts for analysis and study.

BUREAU OF AERONAUTICS

This Bureau is issuing "The Airway Pilot" which provides up-to-date information and maps of air routes and air landing fields. They also are preparing air navigation maps for portions of routes not mapped by the Army and Navy. For facts about airway publications, address the United States Bureau of Aeronautics, Department of Commerce.

MISCELLANEOUS

Remedy for Disappearing Game Fish. Address by the Secretary of Commerce, Herbert Hoover.

This interesting discussion of native game fish is the text of an address delivered before the Isaac Walton League at Chicago.

All of the above publications may be obtained from the Superintendent of Documents, Washington, D. C., while those of the Bureau of Foreign and Domestic Commerce are also available at the District Offices of that Bureau.

HELEN M. STRONG.

KENTUCKY GEOLOGICAL SURVEY. Series VI. Geographic Studies, under the direction of Dr. Willard Rouse Jillson, State Geologist of Kentucky.

I. *Geography of the Jackson Purchase.* Darrell Hang Davis. 180 pp., maps, diagrams, illustrations. 1923.

II. *Geography of the Kentucky Mountains.* Darrell Hang Davis. 180 pp., maps, diagrams, illustrations. 1924.

III. *Geography of the Western Coal Field.* Wilbur Greeley Burroughs. 211 pp., maps, diagrams, illustrations. 1925.

IV. *Geography of the Kentucky Knobs.* Wilbur Greeley Burroughs. 284 pp., maps, diagrams, illustrations. 1926.

V. *Geography of the Blue Grass Region.* Darrell Hang Davis. 215 pp., maps, diagrams, illustrations. 1927.

VI. *Geography of the Pennyroyal.* Carl Ortwin Sauer, assisted by John B. Leighly, Kenneth McMurry, and Clarence W. Newman. 303 pp., maps, diagrams, illustrations. 1927.

This admirable series of six studies of the geography of the several regions of a single state constitutes part of one of the most ambitious plans thus far projected for the intensive and exhaustive study of the relationship of people and their activities to the environment and resources of the terrane on which they live. Each of the volumes is a complete study in itself, but all together they form a unit of geographic presentation that will constitute a model for other states to follow. Though somewhat of a pioneer attempt in this country, in the hands of the trained and competent men who have done the work, the series has been molded on a sound scientific pattern and wrought to a finished treatise that compares favorably with some of the best work of the same kind done in Europe.

It is the purpose of this review to bring to the attention of economic geographers particularly the wealth of material for their use that the volumes of this series contain, and to recommend it as a safe and laudable guide for the same kind of work elsewhere. It is true that other states, notably Iowa and Michigan, have done similar work, and in some few cases have done as good work; but none has gone at the matter so comprehensively, so systematically, or has accomplished so much as has Kentucky. The day is at hand when such geographic surveys will be demanded by the people of all the states, for without them intelligent programs for the wisest utilization of resources, the soundest expansion of industries, and the happiest communities of the citizens are impossible.

To review all six volumes exhaustively is not possible in this issue because of limited space, but because of their interest and value each will be characterized briefly.

The Geography of the Jackson Purchase by D. H. Davis is a study of the Distribution and Activities of Man in the Gulf Embayment Area of Western Kentucky. In this western extremity of the state "industrial development has not as yet been so extensive as to complicate excessively, the responses to environment, though human occupation has persisted for a sufficient period to bring out maladjustments to present economic opportunities." The physical environment is treated as fully as is necessary to a full interpretation of the social and economic conditions found among the people, and the adjustments to this environment and the resources are clearly explained.

The Geography of the Mountains of Eastern Kentucky by the same author deals with the eastern end of the state, but the same general plan of organization and treatment is followed as in the former volume. The purpose of this study was to describe the existing conditions of human occupation in the Kentucky Mountains, "in terms of regional opportunity wherever possible, to differentiate between the various portions of the area on the basis of differences in physical equipment and variations in response, and to indicate the opportunities for advantageous future development."

The Geography of the Western Kentucky Coal Field by W. G. Burroughs treats "the southeastern portion of the great Eastern Interior Coal Field which includes parts of Indiana and Illinois. The development of the natural resources of this region in Kentucky to the present time, and the opportunities that exist for their future growth are discussed. The influence of geology and geography upon the life, industry, and commerce are emphasized."

The Geography of the Kentucky Knobs by the same author is an excellent treatise of that "belt of conical hills and detached ridges with a narrow strip of rolling land forming their inner margin, which extend in the form of a horseshoe" about the famous "Blue Grass" region of North Central Kentucky. The response of the people of this narrow belt to their environment is as distinct as is the region itself, quite different from the regions within and without the "Horseshoe" but having certain similarities and relationships that connect it with that on either border.

The Geography of the Blue Grass Region by D. H. Davis is best described in his own words as "a description and explanation of the present distribution and economy of the area; the subdivision of the entire region into smaller units of essentially uniform physical equipment and unity of response; and the indication of opportunities for improvement of existing conditions and advantageous future development." The Blue Grass is one of the most prosperous and progressive regions in the United States, a district where conditions are most favorable for happy, contented living, and the development of a high state of culture.

The Geography of the Pennyroyal by C. O. Sauer

and his assistants is an excellent climax to the series, the concluding volume on the major natural regions of Kentucky. The "Pennyroyal" lacks the sharp definiteness of boundary, the unity of characteristics that constitute an ideal geographic region, but nevertheless it is a distinct division of the state with characteristic communities and cultural conditions, and throughout history with a function that justifies Sauer's apt descriptive term "corridor region." The name Pennyroyal, current only for the southwestern and southern counties of the district, is expanded to apply to the whole region described, rather than only to the typical or nuclear section. The "Pennyroyal" constitutes a broad belt surrounding the Western Coal Belt and extending southward to the Tennessee boundary, eastward to the mountains, and westward to the Jackson Purchase.

Besides their interest and value as regional geographic studies these volumes constitute a foundation for further surveys and studies for the promotion of Kentucky industries and the development of Kentucky resources that cannot be improved upon, particularly in connection with similar geologic studies by the same survey. They can be used as textbooks or as collateral reading in the schools and as references by research students in a score or more fields.

The State of Kentucky may well be grateful for Doctor Jillson's leadership in this excellent project. Few men would have had the breadth of vision, and courage of conviction, to have essayed it. On the other hand, Doctor Jillson is to be congratulated upon having a state and a state legislature able to visualize the benefits of the project and willing to support it, and upon finding so capable and well trained a staff to do the work.

W. ELMER EKBLAW.

TAYLOR, GRIFFITH. *Environment and Race.* xv and 341 pp.; maps, charts, and diagrams. Oxford University Press, New York, 1927. 8½ x 5¾ inches.

From the detached viewpoint of his advantageous antipodal location, Griffith Taylor has envisaged a novel and startling panorama of the migration and settlement of peoples over the surface of the earth which he presents in this volume with his characteristic clarity and logic of style and stimulating force and freshness of the pioneer frontier where the world is yet in the making.

Novel and startling as this panorama seems, it bears the stamp of careful thinking and reading, the analyses of great quantities of more or less sound and substantial data, and the study of a vast contemporary literature. For years the author has traveled and read and written much, meeting the best men of his time, counseling with the wisest students of the civilized world, pondering all he has seen, and heard, and done, until in this ambitious book he has crystallized in fascinating form the harvest of his labors. He challenges the best thought of this age; he lifts his voice in warning as well as encouragement; he draws his conclusions courageously with the wisdom of a seer and a prophet.

Environment and Race comprises four parts: I. Introduction, which states the scope of the book, and embraces a discussion of "The General World Plan," "Ethnological Principles, Nationality, and Language," and "Ethnological Criteria"; II. The Past, wherein the author narrates the circumstances of the changing environment in Australasia, Africa, Eurasia, and America, and applies them to his "Immigration-Zone Theory of Race Evolution" in a most forceful way; III. The Present, which takes the development of the white race in the Australian environment as illustrative of its expansion over the temperate grasslands of the world, and particularly upon the more arid lands, and elucidates the principles which seem to direct or determine its activities; and IV. The Future, in which the author daringly enters the fatal field of prophecy and presents his startling, but none the less reasonable and apparently well-supported conclusions, regarding the potential regions of close white settlement and the future distribution of the white race.

Naturally, the Australian viewpoint is emphasized, whether unduly for the purpose of the book it would be hard to say; but every chapter reveals how cosmopolitan and yet inclusive are the author's deductions. His detached position has created for him a definite advantage that his training and world-wide associations have permitted him to use to the utmost. The intrinsic value of the book is enhanced by the invigorating freshness and stimulating daring of the author's views and personality.

The chief peril to which Griffith Taylor exposes himself is the danger which every ardent protagonist of a new idea must face, that is, that he will be led to present chiefly those arguments which tend to support his thesis, ignoring those which weaken his position; yet it is to such pioneering and stimulating thinkers who have the courage of their views, as Wegener, and Daly, and Huntington, and Taylor, that we of slower thought and pace, and lesser daring, must look for leadership into new realms, even in geography as all the sciences.

The book is invigorating and stimulating; it presents much old material in new dress, and much new material; it should meet with wide favor and much use.

W. ELMER EKBLAW.

GRIFFITH, ERNEST S. *The Modern Development of City Government in the United Kingdom and the United States.* xix and 745 pp., in 2 vols., appendices. Oxford University Press, London, 1927. 8½ x 5½ inches.

The point of view in this study is historical and political rather than geographical, but it contains

much material for anyone interested in urban problems and development. Cities have increased in the United States until over half our population is urban, but this is the first comparative history of city governments, although briefer studies have been made. The author states that starting with a joint heritage and a common legal basis each nation has developed a system which in most essentials is entirely different from the other.

The method Mr. Griffith has followed is to consider the evolution of the cities with emphasis upon the unfolding of the problems common to both countries; and secondly, with this historical background in mind, to concentrate attention upon a few of the major problems inherent in city governments. In the first volume the cities are divided into three periods: first, the cities of the United States before 1870; then, the British cities for the same period. This date was chosen because prior to then local government as a science scarcely existed. It was about this time that the city in the modern sense came into being. These chapters are intended to give in summarized form the minimum of material necessary to account for the cities as they existed in 1870, particularly with reference to the elements in which the two countries exhibited great differences. The cities are next treated in turn up to 1900 and after that date. This division was chosen arbitrarily but because greater city development has come in both countries since then.

The author contends that aside from the performance of functions, the three chief problems facing any city concern the framework of government, finance, and relations with central authority; thus, the second volume deals with these problems and with systems of city government. At the end are several appendices of source material and an excellent bibliography. Part of the material in these volumes is derived from extant books and the rest from primary sources, such as government documents.

The cities of any civilized country face much the same problems—adjustment of personal interest in the common good, conservation of health, arrangements of leisure time, training the future citizens, caring for dependents, and problems of public service. Here may be found material on what has been done along these lines.

JULIA M. SHIPMAN.

REYNOLDS, PHILIP KEEP. *The Banana: Its History, Cultivation, and Place among Staple Foods.* viii and 181 pp. Diagram, map, illustrations, bibliography, index. Houghton Mifflin Company, Boston and New York, 1927.

This volume represents an eminently successful attempt to bring together every fragment of potentially serviceable information with respect to bananas. The author's many years of association with the United Fruit Company have made him familiar with phases of the industry which would be obscure to anyone less well equipped, however eager and intelligent his inquiry. He has written a book that has much about it to attract the lay reader interested in one of the greatest of modern commercial romances, yet in doing this he has not sacrificed a sound and thoroughgoing scholarship with respect to scientific detail.

Professor Oakes Ames of the Department of Botany at Harvard contributes most of the chapter on Botanical Relations. The study of the early history of the banana plant and its migration around the world from its original home in India to northern Africa, thence to the Canary Islands, and finally, in the care of a Spanish missionary priest, to Santo Domingo, is one which must have allured the writer as it does the reader. The work of building the great modern commercial structures which rest, so to say, on the banana plant, and the problems of creating and operating tropical plantations, present pictures which lack only the perspective of time to make them as romantic as the four-century-old story of the Friar Tomás de Berlanga.

A vast amount of medical study is summed up in the very elaborate chapter on Food Value, and the somewhat astonishing theory seems to be supported that bananas are an ideal baby food.

The fascinating research of Dr. Herbert J. Spinden of the Peabody Museum of Harvard University has been drawn upon for data to construct a parallel between the ancient Mayan civilization and the modern civilization of the tropics which, primarily because of the advance of sanitation and preventive medicine, is able to prevail where the Mayas went down to defeat before plagues of which they understood nothing.

Over sixty excellently chosen and splendidly reproduced illustrations, elaborate footnotes, and a most exhaustive bibliography combine to make the volume a valuable and definitive work of reference.

JOHN GOULD CURTIS.

BROWN, R. N. RUDMOSE. *The Polar Regions.* vi and 245 pp., and many maps. E. P. Dutton & Company, New York, 1927. 9 x 5½ inches. $3.75.

What Greely's "Handbook of Polar Discoveries" has become to the history of polar exploration, Brown's "The Polar Regions" will become to the geography of the regions about the poles. It is a well-digested summary of all the facts and their relationships at present known about the regions to which the book is devoted; as such it is invaluable to the student or the layman interested in polar geography, an indispensable reference book that must be included in the shelf-list of every well-equipped library.

The first chapter, "Polar Regions: Their Extent," is such a satisfactory discussion of the merits of the several boundaries set by Supan, Koppen, Herbertson, de Martonne, Bruce, and

others, that one realizes better than ever before how futile it is to attempt to fix boundaries in nature, not least of all in the Arctic; this satisfactory treatment is an earnest of the many chapters that follow, and which include thorough discussions of the climate; the contour, relief, and elevation of the lands; the sea ice and glacial ice; the flora and fauna; the Eskimo; the industries, trade routes, hygiene, etc. The bibliography is the least satisfactory part of the book, being, as the author states, incomplete, and so inadequate.

The book should be more widely read than it will be. Our people still prefer reading the sensational, thrilling, spectacular popular books of adventurous explorers, fragmentary and lacking in balance and perspection as they are, to studying such a sound, inclusive, well-proportioned book as this "The Polar Regions" of Brown, who besides being a *bona fide* explorer is a thorough scientist and scholar.

It is hard to resist the temptation to discuss many of the points that the author makes throughout the book, but the reviewer will yield only to take up the matter of the author's very temperate and reasonable appraisal of the future development of reindeer-grazing in Arctic Canada. His estimate of the carrying capacity of the tundra lands is not far from correct, though perhaps somewhat optimistic, conservative as it is in comparison with Stefansson's enthusiastic hopes. The vegetation on the Arctic plains does not renew itself readily and the pasturage, which seems abundant at times, would require several years for regrowth if once grazed close. More thought and attention should be given to the domestication of the muskox before it really faces extinction. This superb animal furnishes meat incomparably more palatable and nourishing than caribou- or reindeer-venison, is not so migratory as the caribou, and though not so prolific can maintain itself on more limited area. No really satisfactory and systematic attempt has yet been made to domesticate it; but if ultimate success should be achieved in such an attempt, much of Canada, the Labrador, and even northern Newfoundland could be made to yield great supplies of meat as delicious as any beef or mutton.

But this is a digression from the real purpose of the review, which is to state that "The Polar Regions" by R. N. Rudnose Brown, is the best general book on polar geography, that has yet appeared.

W. ELMER EKBLAW.

SHEEAN, VINCENT. *An American Among the Riffi.* xxi and 345 pp.; 32 full-page photographs, 3 maps. The Century Company, New York. 1926. 5¼ x 6¾ inches.

Few Americans have successfully crossed Morocco and the Rif. As long as it remains such an arduous adventure as Mr. Sheean experienced, few will wish to attempt it. "An American Among the Riffi," then, may be regarded as an unusual opportunity to gain first-hand information of the people of these little-known lands.

Mr. Sheean traveled from Tangier to Rabat on the Atlantic coast, thence eastward through Fez and Taourirt to Oudjda, where he turned north to Port Say on the Mediterranean. He was hoping to get in touch with someone who would get him into or across the Rif. From Port Say he turned back to Taourirt, next proceeding northeasterly across the Rif to the Mediterranean again at Beni Boufra. Using both sea and land, he finally arrived at Tangier. This may look comparatively simple as you trace his route on the carefully made maps in the front of the book, but crossing Mohammedan territory, where strangers are regarded as religious and political enemies, proved extremely hazardous until the author obtained the protection of the Sultan. Thereafter, dangers gave place to difficulties.

Mr. Sheean is chiefly interested in the people he encounters, and, as he says, attempts to make out the men and motives involved in this Islamic Revolt. He makes us conscious of the many tribes with widely varying characteristics, united under a single religion. Of their leader he writes, "Mohammed ben Abd-el-Krim is the leader without whom the blind forces of Islam could never have reached any kind of organization in Morocco. He has now definitely assumed the rôle of Islam's leader against Christian invasion. His appeal to Islamic consciousness has been succinct and forceful; he has attacked France in the name of the common religion of all northern Africa, and his significance by far transcends the local importance of a frontier war. Abd-el-Krim has aroused fervor in a country where no Islamic leader has appeared for many decades; and therein lies his principal menace to the powers interested in North Africa, as well as his chief significance to the world movement of which he is a part."

The writer does not confine himself wholly to descriptions of peoples, but includes an account of the government of the territories and of the duties of the secretaries of the central government. To some it may be enlightening to learn that the Rif does not include all of northern Morocco, but only a definite strip beginning at Beni Boufra west of Alhucemas and extending to Melilla and south to the Arab tribes of the French border. "On the other side of this second range of mountains began the veritable Rif of Arab and Shilluh song and story; crimson mountains flung against a sky of hieratic blue, gorges magnificent and terrifying, peaceful green valleys between protecting precipices. Between the first and second ridges of the Rif Mountains one might think of Colorado; after the second ridge no comparison exists with any other—where. That deep burning red of far-flung hills is, so far as I know, unique. A mining engineer in

Beni Touzin would have thought only of the fabulously rich iron deposits underneath it all, but to a mere traveler it was a picture instantly recorded, and worth carrying forever, against need of beauty."

Descriptions of the country are comparatively few, but the book is not lacking in vivid pictures, as "The trail led across a bare and deserted valley into another series of hills. No more than two hours after we left Metalsa we came upon a forest; its trees were the first I had seen since the gardens of Fez. After another hour we passed a group of Riffi women with bundles of wood on their backs, trudging toward some village." In another place we read, "Market day meant the gathering of the whole Metalsa tribe, and most of the Beni Bou Yaki, in the plain below our cliff. Men, women, and children came from the hills around to the flat space across the river bed where they bought and sold their live goats, chickens, mules, or donkeys, and their oranges, walnuts, raisins, dried figs, woven cloths, and smuggled teapots and kettles. There was very little money in circulation; generally one bought a teakettle and paid with a goat, or bought a goat and paid with a teakettle. Plain barter was the rule rather than the exception." In describing one of the better houses where he was quartered he writes, "The house was a two-storied one set among almond trees now all in flower. There was a great oaken bed from Spain covered with thick rugs and silk pillows of many colors. In the corner was the great stone drain for the ablutions. The house was made of mud, but the rugs within would have made the fortune of a dealer on Fifth Avenue."

The book on the whole gives a spirited picture of this ignorant and fanatic people who make up the Arab empire of Morocco.

JULIA M. SHIPMAN.

MCFALL, ROBERT JAMES. *The World's Meat.* xvii and 624 pp., maps, charts, and tables. D. Appleton & Company, New York, 1927. 8¼ x 5½ inches.

As the problem of the world's food supply presses for solution into more and more of the world's discussions, such books as "The World's Meat" become increasingly valuable as bases for attacking the problem. The question of adequate food for the peoples of the world is no longer local or provincial; it has become the dominant factor in the world's economy and politics, and its powerful influence upon the thought and activities of our time surpasses that of any other force perhaps.

Meat has ever been one of the most important foods in the diet of the race, and without a reasonable portion of meat foods in the daily diet the average man or woman does not feel satisfied. Like the Eskimo who rises from a table of "white man's food" to partake of another meal of *real* food—walrus or seal or bear meat and liver, often raw or frozen—the working man of Europe, or America, or Australia continues hungry after a vegetarian meal. Meats reënforced by eggs and milk, and other dairy products, remains a bulwark of the world's food resources, and requires for its production most of the world's area. Without meat much of the world would go hungry.

The place of meat in the world's economy is exhaustively treated in Doctor McFall's excellent book. The book is divided into four parts: I. "Meat and the Food Problem," in which the importance of meat as a food, the relation of meat to food production, the distribution and development of meat production, and types of meat production are thoroughly presented; II. "The Situation Over the World," the major part of the book, by which all the regions of the world are discussed with regard to production, supply, and consumption of meat; III. "Marketing," in which marketing problems and agencies, combinations in the meat trades, and international trade in wheat are treated fully; and IV. "Conclusion," wherein the author ventures to predict in a general way the course of future production and consumption of meat and meat foods.

A paragraph from the final chapter of the book well bears quoting because of its significance: "The maintenance of a satisfactory diet including a due proportion of meat is one of the material standards of living that is very important in the western world. To relinquish this standard would probably have serious consequences. Fortunately there seems to be a stronger tendency to maintain such material standards than even to increase the population in the more highly civilized western nations. As already noted, the increased meat consumption on the continent of Europe in the last century was accomplished in spite of the fact that meat was growing more costly than cereal foods. Of course, it is impossible to be certain that nothing will undermine the virility of the western peoples and cause them to relinquish their standards. Civilizations, like individuals, may grow old and die. Of this, however, there is no proof and all the present indications point to the conclusion that other factors than the food supply will hold human expansion within reasonable bounds and that civilization will jealously maintain and enlarge its material standards of living."

"The World's Meat" is an interesting book, valuable as a reference to all students of our resources, our industries, and the economics of our domestic and foreign relationships.

W. ELMER EKBLAW.

GOODE, J. PAUL. *The World on Goode's Homolosine Projection, interrupted for the Continents.* No. 401 C. A map in the Goode's Series of Base Maps and Graphs. University of Chicago Press, 1927. 3 feet, 9 inches x 8 feet, 6 inches. Scale for use up to latitude 40°, 1 inch = 250 mi.

This improvement over the old Mercator projection for the correct representation of areal

distribution over the earth's surface has not been put to better use than for this base map which Professor Goode has prepared and issued for distribution through the University of Chicago Press. For nearly all teaching purposes it is superior to any other world map now being used, and should be generally utilized by geography teachers and students.

Since every one is familiar with the advantages offered by Professor Goode's homolosine projection, it is unnecessary to recount them. A word of approval and endorsement of this excellent world base is likewise unnecessary, except for the benefit of those who have not seen it; for those who have, the favorable notice is superfluous, for it speaks for itself.

It is an excellent base map. Professor Goode has rendered another valuable service by preparing it. It is accurate, clear, and well adapted to almost any purpose.

W. ELMER EKBLAW.

Illinois State Geological Survey. Map and Directory of Illinois Mineral Industries and Operators, compiled by H. P. Christensen and E. Erb, under direction of Morris M. Leighton, Chief of the Survey. Map, 4 feet x 2 feet, 6 inches. Directory, 74 pp., 9 x 6 inches.

The Illinois State Geological Survey has long been noted for its valuable contributions to the economic and geographic literature of the state as well as for its many excellent geologic studies and reports. This latest publication is valuable in all three fields, and in a score of others as well.

While it is intensely practical and utilitarian in its purpose and its application, this report is based upon years of careful, scientific exploration and study of which much, at the time, seemed pure science without any possible direct utilization. The Illinois State Geological Survey has always been characterized by a nice balance of pure and applied scientific investigation, and this policy of adjustment is continued. The map and directory with which this review is concerned is strictly utilitarian, as it was intended, and as such will aid in the development of the material prosperity of the state by facilitating the intelligent utilization of its resources. The compilers and their chief are to be congratulated upon the eminently satisfactory completion of this painstaking work.

W. ELMER EKBLAW.

SMITH, D. H. *An Economic Geography of Europe.* xii and 257 pp.; maps, and charts. Longmans, Green and Company, New York, 1925. 7½ x 5 inches. $1.50.

In this compact little volume the author has presented most of the fundamental facts of the economic geography of Europe so clearly and logically that little essential material is omitted. It is strictly a student's book, but the layman who desires a concise reference work on this subject would have to seek far for a better one.

Certain typical regions such as the Paris Basin, the industrial areas of Great Britain, and the agricultural plains of the Po Valley have been adequately treated, but as obviously is necessary in a volume where only fundamentals are emphasized, many less important regions are less fully considered.

Throughout the work the author has held consistently to his plan and consequently the unity, balance, and clarity have been uniformly maintained. The volume constitutes a model of its kind, and deserves a place on every geographer's bookshelf, as well as in every good library, however small it may be.

W. ELMER EKBLAW.

NOTICES

REDFIELD, WILLIAM C. *We and the World.* vi and 194 pp.; many pictures. Silver, Burdett and Company, New York, 1927.

A supplementary grade school reader dealing interestingly with widely used commodities and their relations to environment, industry, and trade.

NEIHARDT, JOHN G. *The River and I.* x and 199 pp. Macmillan Company, New York, 1927. $3.00.

A poetically descriptive account of the Missouri and the lands it traverses, and their part in the development and history of the nation—an impressionistic word-picture of an heroic "landscape."

VAN DEUSEN, ELIZABETH K. *Picturesque Porto Rico.* xii and 291 pp. Silver, Burdett & Company, New York, 1927.

History and geography combined in a literary presentation of the "atmosphere" of Porto Rico. A good supplementary grade school reader.

HOLLANDER, JACOB H. *Economic Liberalism.* 197 pp. The Abingdon Press, New York, 1927.

A discussion of the recent tendency toward principles of democracy in social and economic activities.

HIGH, STANLEY. *Europe Turns the Corner.* 301 pp.; index. Abingdon Press, New York, 1927.

A summary of the events from 1919 to 1924 that sound a hopeful note in the political economy and international relationships of the European nations, leaving the impression of a future worthy of faith.

CARLETON P. BARNES.

NOTE.—Owing to unexpected lack of space in this issue, the section devoted to "Our Contemporaries" is omitted.—EDITOR.

ANNOUNCEMENT

THE series of articles, *Agricultural Regions of the World*, is continued in this issue with the first instalment of *Agricultural Regions of South America*, by Dr. Clarence F. Jones of Clark University, presenting the latest and most authentic data available on South American agriculture and including a large map in colors indispensable to every student of South America; and with the fifth instalment of *Agricultural Regions of North America* by Dr. O. E. Baker of the United States Bureau of Agricultural Economics. These are both richly illustrated by excellent maps in black and white portraying graphically the agricultural situation in the two continents. Both these articles will be completed in later issues by textual and map material of the highest class.

Agricultural Regions of Africa, by Homer L. Shantz of the University of Illinois and president-elect of the University of Arizona; *of Australia*, by Griffith Taylor of the University of Sidney, one of the foremost geographers of the world; and *of Asia*, by Olof Jonasson of the University of Commerce of Stockholm will follow in later issues to complete the finest geographic discussion of the world's agriculture thus far published.

To obtain the complete series of these extremely valuable articles, which present for the first time on such a comprehensive and accurate basis the significant divisions of the world's most important industry, it will be necessary to subscribe at once for ECONOMIC GEOGRAPHY, and date back to the October, 1926, issue.

In addition to this series of articles on agriculture, other series are being initiated; every issue will also contain four or five other articles dealing with urban and regional geography, with problems of land utilization, with programs of development of resources, with commerce, with transportation, with health, and with the hundred and one other subjects that are of present geographic interest, all by the most competent and best informed authorities in their respective fields. ECONOMIC GEOGRAPHY is indispensable to the intelligent citizen.

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